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# South Carolina Department of Natural Resources



## Annual Report 1994-1995

South Carolina  
Department of Natural Resources  
PO Box 167  
Columbia, SC 29202

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# South Carolina Department of Natural Resources



James A. Timmerman, Jr., Ph.D.  
Director

South Carolina Natural Resources Board  
Columbia, South Carolina

Gentlemen:

Attached hereto is the Annual Report of the Department of Natural Resources.

The report contains a survey of the activities and accomplishments of the Department of Natural Resources and each of its Divisions. Although the Annual Report is somewhat lengthy, it gives a summary of the activities. More detailed information is available and can be supplied to you if desired.

We look forward to working with you during this next year.

Respectfully submitted,

A handwritten signature in black ink, reading "James A. Timmerman, Jr.", is written over a horizontal line.

James A. Timmerman, Jr.  
Executive Director



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## State of South Carolina

*The Honorable Carroll A. Campbell Jr., Governor*

### South Carolina Natural Resources Board



Marion Burnside  
Chairman  
Hopkins

J. M. Pendarvis  
Estill

Thomas W. Miller  
Vice Chairman  
Anderson

Jake Rasor Jr.  
Cross Hill

Dr. Howard H. Poston Jr.  
Kingstree

Knox L. Haynsworth  
Greenville

George L. Vickery  
Georgetown

FISCAL YEAR  
July 1, 1994- June 30, 1995

**SOUTH CAROLINA  
DEPARTMENT OF NATURAL RESOURCES**

Dr. James A. Timmerman, Director ..... Columbia

Larry Cartee, Assistant Director ..... Columbia

John B. Reeves, Deputy Director  
Administrative Services ..... Columbia

Prescott S. Baines, Deputy Director  
Division of Conservation Education  
and Communications ..... Columbia

Dr. C. W. Clendenin, State Geologist  
Geological Survey ..... Columbia

Cary D. Chamblee, Deputy Director  
Land Resources and Conservation Districts ..... Columbia

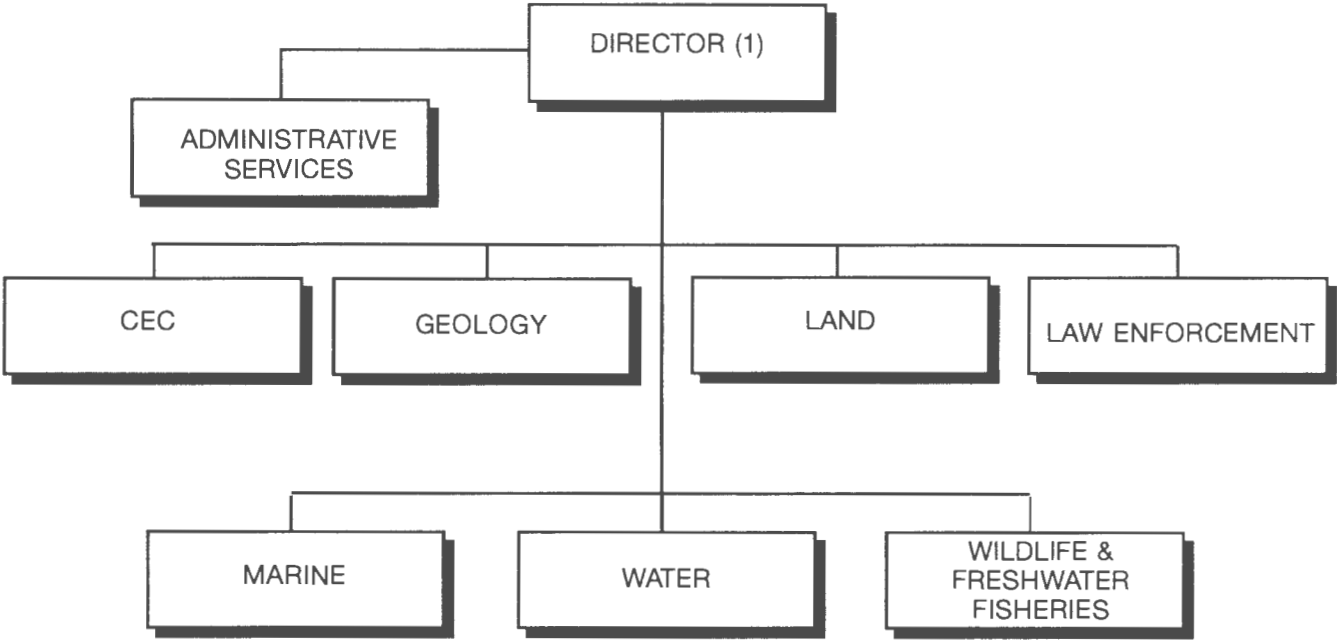
William K. Chastain, Deputy Director  
Division of Law Enforcement ..... Columbia

Dr. Paul A. Sandifer, Deputy Director  
Division of Marine Resources ..... Charleston

Alfred H. Vang, Deputy Director  
Water Resources ..... Columbia

W. Brock Conrad Jr., Deputy Director  
Division of Wildlife and Freshwater Fisheries ..... Columbia

South Carolina Department of Natural Resources



## **DIVISION OF ADMINISTRATION AND SUPPORT**

Overall supervision for the South Carolina Department of Natural Resources is provided by the Director. He is appointed by the South Carolina Department of Natural Resources Board and is responsible to them.

Policy for the operation of the Department is set by the Board, which is composed of seven members, one from each congressional district, appointed by the Governor, with the advice and consent of the Senate.

The Division of Administrative Services provides administrative support for the entire Department. This support comes through the division's accounting, purchasing, information technology, supply and equipment, title and registration, and construction units.

Administrative Services is responsible for the administration of all funds as required by law. These include federal, state, and other revenues. This division is also accountable for inventory and all fixed assets, construction and repairs, and land owned or leased by the Department.

The Division of Administrative Services also provides budget expertise by identifying the financial needs of the Department to the Legislature. Assistance is also given to the Executive Office for special assignments and policy reviews as needed.

**FISCAL REPORT**  
**Source of Funding for Expenditures by Program**  
**FY 1995**

	<b>Appropriation</b>	<b>Other</b>	<b>Total</b>
Administration/Support	2,496,228	1,401,871	3,898,099
Conservation Education and Communications	1,363,569	694,814	2,058,383
Titling and Registration		874,663	874,663
Game	156,819	6,704,441	6,861,260
Fish	574,269	2,911,073	3,485,342
Law Enforcement	6,193,790	4,944,466	11,138,256
Boating Safety	45,298	2,085,918	2,131,216
Marine Resources	4,797,379	4,126,700	8,924,079
Heritage Trust	565,724	465,539	1,031,263
Water Resources	2,804,296	2,091,631	4,895,927
Land Resources	2,021,855	727,207	2,749,062
Geological/Geodetic	248,575	33,975	282,550
Employer Contributions	4,109,481	2,936,415	7,045,896
<b>TOTAL</b>	<b>25,377,283</b>	<b>29,998,713</b>	<b>55,375,996</b>



**Statement of Hunting and Freshwater Fishing Licenses Sold  
FY 94-95**

<b>Number of Licenses Sold</b>	<b>Type of License</b>	<b>Total Revenue</b>
3,819	County Hunting License	15,276.00
10,908	State Hunting License	119,988.00
14,206	Annual Non-Resident Hunting License	1,037,038.00
9,608	3-Day Non-Resident Hunting License	230,592.00
18,637	Non-Resident Big Game Permit	1,472,323.00
2,953	Non-Resident Shooting Preserve	23,624.00
1,797	10-Day Non-Resident Hunting License	86,256.00
4,426	Resident Big Game Permit	22,130.00
4,172	Resident Junior Outdoorsman's License	62,580.00
853	One Day WMA Hunt Permits	4,689.00
195,413	Resident Fishing License	1,758,717.00
39,968	14-Day Resident Fishing License	159,872.00
61,575	7-Day Non-Resident Fishing License	615,750.00
16,077	Annual Non-Resident Fishing License	546,618.00
118,453	Combination Fishing and Hunting	1,895,248.00
47,937	Resident Sportsman License	2,061,291.00
4,341	Resident WMA Permit	128,059.50
3,782	Non-Resident WMA Permit	283,650.00
7,854	Lakes and Reservoirs Permit	15,708.00
18,589	S. C. Duck Stamps	92,945.00
1,047	3-Day Non-Resident Lake and Reservoirs Permit	2,094.00
<b>Total</b>		<b>10,634,448.50</b>

## **DIVISION OF CONSERVATION EDUCATION AND COMMUNICATIONS**

The Division of Conservation Education and Communications (CEC) with offices in Columbia and Charleston is staffed by 37 full-time personnel supporting all divisions and programs of the S.C. Department of Natural Resources. The division's goal is to assure that information and education efforts are the result of proper planning and coordination, keeping in mind the needs of public, agency goals, cost-effectiveness, thorough review, accuracy and professional standards.

CEC provides the following agency-wide services: conservation education, Hooked On Fishing Not On Drugs program coordination, publication advisement, coordination and design, art and graphics, duplicating services, agency mail room, *South Carolina Wildlife* magazine production, marketing and fulfillment, magazine product marketing, still photography, RESPECT outdoor ethics campaign, agency news releases, weekly fishing trend reports, news media assistance, spokesperson services, video production (training, documentary, public service announcements), video library (free loan instate), writing and editing, *S.C. Natural Resources* newspaper, and freshwater fishing records.

### **"HOOKED ON FISHING NOT ON DRUGS" Program**

The "Hooked on Fishing Not on Drugs" (HOFNOD) program offers a sound purpose and a strong environmental message. Participating in this program offers South Carolina's youth an opportunity to experience an education in natural resources and an alternative to drug use.

Funding and distribution of promotional items is coordinated through the Conservation Education and Communications' administrative office. In February 1995, the Harry Hampton Memorial Wildlife Fund Board of Directors approved the allocation of \$6,895 for the HOFNOD program. In May 1995, a donation of \$1,000 was made by the SCANA Corporation to the Harry Hampton Memorial Wildlife Fund designated to the HOFNOD program. These funds were used to purchase promotional items for rodeos being held in eight of the South Carolina Department of Natural Resources' law enforcement districts. Seventeen department-sponsored rodeos were held throughout the state. The department co-sponsored with other state agencies and outside organizations approximately 12 other fishing events, lending assistance in manpower, coordination and promotional items. Promotional items were also used to assist law enforcement and education staff in promoting the HOFNOD program at schools and other outside organizations. These rodeos and other events helped to reach over 30,000 young people and adults with the HOFNOD message during 1995.

Department staff continue to seek other funding sources through state and federal grants.

### **EDUCATION SECTION**

The Education section plans, directs, and coordinates a comprehensive wildlife education, which teaches the ecological principles of our natural resources to the citizens of South Carolina. These programs have received awards on both the national and state level for their effectiveness and efficiency. Evaluation and personal service to teachers, families, and other individuals who work with youth are the essence of the conservation programs. The following programs are administered by this division:

**Project WILD**-Project WILD is a national award-winning interdisciplinary environmental and conservation education program of instructional workshops and supplementary curriculum materials for teachers of K-12. Each participant receives the Project WILD Activity Guide which contains over 100 activities. Workshops are six hours in length with a minimum of 15 participants. There is no charge for the program. Project WILD is reaching 2500 teachers participating per

year. 21,000 teachers since 1984.

**Aquatic WILD**-A continuation of the Project WILD program, Aquatic WILD emphasizes aquatic wildlife and aquatic ecosystems. Each participant receives the Aquatic WILD Activity Guide with over 40 activities. Workshops are four hours in length with a minimum of 15 participants. There is no charge for the program. Aquatic WILD is reaching 2500 teachers participating per year.

**Conservation Education Programs**-Designed to introduce students to the Department of Natural Resources, this program involves the use of live animals and enhance any curriculum. There is a \$30 charge for these programs. Conservation Education Programs is reaching 60-80,000 persons participating per year.

**Camp Wildwood**-Camp Wildwood is designed for high school students who enjoy being out-of-doors and strives to increase their knowledge and experience in natural resources management. Located at Kings Mountain State Park about fifteen miles northeast of York, SC, Camp Wildwood is open to all tenth (must have completed ninth grade prior to camp) through twelfth grade high school students. Enrollment is limited to one-hundred campers. A camper may enroll through sponsorship by a local chapter of the South Carolina Garden Club and The South Carolina Wildlife Federation. A camper may also self-enroll if the parent or guardian so chooses. Sponsorship usually includes payment of the camp fee by the sponsoring organization. In addition, a limited number of scholarships are available from both organizations at the state level. Camp Wildwood is reaching 125 campers participating per year.

**Whale Program**-This program uses math, art, language arts and other subjects to introduce students to whales. Instructor provides information on whales and helps students construct a Blue Whale to scale. Cost of construction averages \$100. There is a \$30 charge for student groups, no charge for teacher groups. The Whale Program is reaching 1000 participating per year.

**KATE**-For the first time ever, students in grades five through eight are experiencing a true comprehensive education camping program that is changing the way they think about the environment. This is accomplished through camps (three days, two nights) at two locations within the state. This program has already reached over 7,000 children in just two short years. The South Carolina Department of Natural Resources is a coalition member who supports the program financially, trains staff and serves by representation on the advisory board.

**Junior Duck Stamp Contest**-The South Carolina Department of Natural Resources and the Southeastern Wildlife Exposition sponsors the Junior Duck Stamp contest annually. This contest enables students grades K-12 to express their feelings of natural resources through art, however, the drawings are limited to ducks, geese, or swans. This conservation education contest goes on to compete nationally with other local winners from differing areas, and from that competition a winning entry will be selected to be transformed from a drawing to a stamp.

## NEWS AND VIDEO SECTION

**Purpose:** The News and Video Section provides overall news media and video production services to all divisions of the agency and its cooperative projects with other government agencies, public utilities, organizations and private companies. It serves the public through timely and widespread dissemination of needed information.

Through news releases; video productions; and the Internet, the section's purposes are to:

- Inform and educate the public about the condition and value of SC natural resources;
- Encourage ethical and safe conduct afield among outdoors enthusiasts;
- Inform constituents of agency services, application deadlines and points of delivery;
- Provide information on outdoor recreational opportunities;
- Inform constituents of meetings, department actions and opportunities for public input
- Update the public on state and federal laws and regulations.

**Staffing:** At the close of Fiscal Year 1994-95 the News and Video Section had a staff of 8 in two offices in Columbia (headquarters) and Charleston. Staff provided services agency-wide and responded to inquiries from the public and the news media. One position was added in Columbia from the Land Resources and Conservation Districts Division in July when the agency was restructured. In Charleston a staff member was reassigned to the Education Section in January 1995; and another position was pending loss at year's end due to a resignation and budget reduction.

**Video Production:** The section's video unit affords cost-effective in-house production of public service announcements, natural resource documentaries, staff training videos; natural resources footage for television news programs; and footage for cooperative projects with other government agencies and organizations.

**Video Library:** A video/film library is maintained offering a list of department productions on free loan to the public, agency staff, organizations, and other state agencies. A duplicate set of department films and videos updated annually is available on free loan to teachers from the Audiovisual Library of the S.C. Department of Education in Columbia.

**Public Service Announcements:** During FY 1994 TV and some radio spots were produced on: loggerhead sea turtles for S.C. Endangered Wildlife Fund in coordination with 1995 poster campaign; Free Fishing Days and the agency's name change featuring Governor Carroll Campbell; the Palmetto Sportsman's Classic featuring Jim Fowler; and Operation Game Thief, over the limit fishing, litterbugs and drinking while boating featuring professional bass fishermen.

**Training and Educational Videos:** The Saltwater Recreational Fisheries Stamp video was completed in May. An orientation video on the newly-restructured agency was essentially completed by the end of the fiscal year. At the request of Human Resources four workshops were taped and edited for supervisor training: EPMS Workshop Feb. 7, Fair Labor Standards Workshop Feb. 14, Interviewing Workshop Feb. 9, and Sexual Harassment Workshop Feb. 22. The video unit narrated the Life in the Saltmarsh CD-ROM in June at the S.C. Commission for the Blind sound studio. Field production was underway on the Marine Center tour video at the end of the fiscal year.

**Radio Fishing Report:** The Video Unit also produced a weekly freshwater and saltwater fishing report for radio stations through December 1994. This service was ended in preference to the new toll-free national fishing hotline that recently added South Carolina offering expanded features and broad public access.

**News Releases:** The news release program provides a timely means of communication with print and electronic news media covering South Carolina and with the department's field staff, particularly natural resources officers; other state, regional and federal conservation agencies; and the state's conservation organizations. .

A total of 290 news releases and media notices (203 statewide and 87 local) were published during FY 1994-95 with a weekly distribution list of 750, compared to 328 news releases (235 statewide and 93 local) last year. Use of news articles is monitored by reports from a news clipping service. Television stations issue reports annually of free air time provided during public service announcements, amounting to about \$750,000. The section assisted the Greenwood Index-Journal (17,653 readers) in establishing a weekly outdoor page and setting up a system for rapid news receipt for this afternoon paper. The first one was published on April 9, 1995.

Reducing the costs of materials, operation and production, while maintaining quality and effectiveness, is an ongoing effort in the section. Mailing lists for news releases and the department newspaper are updated and monitored weekly. The weekly news release package is printed in-house using both paper surfaces with a size limit of nine sheets to limit production costs.

**News Via Modem and Internet:** In an effort to make department news and information

more widely accessible to the public without increasing costs greatly current computer and telephone lines were used to establish the department's weekly news release on the Internet via the agency's pre-existing World Wide Web home page in the Water Resources Division. The Charleston Post-Courier in March and The Greenville News in August were added to the seven newspapers receiving weekly news releases via modem. In October the section began modernizing one-page weekly news summary to Associated Press in addition to inland and marine fishing reports. Staff continued working with WIS-TV in establishing the agency fishing trends report as a regular feature on the Saturday 9 a.m. news show.

**DEPARTMENT NEWSPAPER:** The department's newspaper, renamed S.C. Natural Resources this fiscal year, has been mailed free to state residents since 1979. The 40-page, Fall 1994 issue was published in early November to explain to constituents the newly-restructured agency, its services and contacts. It was mailed at third-class bulk rate to 65,000 state residents who requested a subscription, to all lifetime license holders and the balance to Sportsmen's license holders. Total costs of printing (75,000 copies) and mailing were \$22,037.34 (\$9,871.68 for printing, presort and addressing; \$12,165.66 for bulk postage), prorated to agency divisions. This was less than the \$25,000 originally forecast as cost savings were realized by single-run printing of all copies mailed which eliminated "removable" sections but kept each division together in page sequence and facilitated printing, addressing and mailing. The planned Summer 1995 issue was complete and being printed (70,000 print run, 65,000 to be mailed) at the end of FY 1994-95 featuring the agency's organization, services, application deadlines and delivery points.

**COOPERATIVE PROJECTS:**

**South Carolina Fishing Hotline:** Coordinated publicity on planning start up of the new 1-800-ASK-FISH toll-free fishing hotline with Governor Carroll Campbell making the first call from South Carolina on Oct. 5. Added later to the fishing hotline were subscription details for South Carolina Wildlife magazine and statewide Hooked On Fishing Not On Drugs fishing rodeo schedule for 1995. The department's weekly fishing trend reports, lake descriptions, frequently asked questions, license dealers, boat ramps and other information are used to update this highly successful federally funded hotline sponsored by the department and the National Sportfishing Promotion Council in this state.

**Hunter Education:** The section's video unit worked with the department's Law Enforcement Division and wildlife biologists to convert the S.C. Hunter Education course into a video format to meet increased demand due to state law making the course mandatory for hunters who would attain age 16 after July 1, 1994. The 8.5 hour course had its premiere airing on April 18 statewide via ETV and telephone call-back set-up. The video course will increase the coverage of the state's hunter education program.

**ACE Basin:** Staff worked with the divisions of Marine Resources, Wildlife and Freshwater Fisheries and the U.S. Fish and Wildlife Service to expand educational opportunities within the ACE Basin; ACE Basin National Wildlife Refuge and ACE Basin National Estuarine Research Reserve. through editing ACE Currents newsletter; publication of "Driving the ACE" brochure; writing news releases and magazine articles; developing display exhibits; coordination of field trips and workshops; etc.

**Lexington Library Fishing Loaner Program:** Coordinated media coverage for Lexington County Library fishing gear free loan program which began in March with an announcement at the Palmetto Sportsman's Classic. This is a joint effort of the S. C. Department and local bass fishing clubs who maintain the equipment.

**State Parks Fishing Loaner Program:** Coordinated media coverage for the July 13 kickoff of the cooperative fishing equipment free loan program at Andrew Jackson State Park which is a joint effort of the S. C. Department of Parks, Recreation and Tourism, the S.C. Department of Natural Resources and local bass fishing clubs who maintain the equipment.

**Joint Mercury Advisory:** Section staff coordinated with Freshwater Fisheries and the S.C. Department of Health and Environmental Control on issuing a mercury advisory notification to anglers fishing and planning to consume fish from certain coastal rivers.

**Wildflower Conservation:** A wildflower education project in cooperation with the Garden Clubs of South Carolina, S.C. Department of Parks, Recreation and Tourism and the University of South Carolina Herbarium was completed resulting in copies of the department's video "Color and Season: Identifying South Carolina's Wildflowers" being distributed to all 12 state Welcome Centers and distribution of three new regional identification brochures.

**Becoming An Outdoors-Woman:** Section staff assisted the Wildlife and Freshwater Fisheries Division and other divisions in developing a "Becoming An Outdoors-Woman" program for South Carolina. This involved attending meetings and training workshops Dec. 4-6 Ocala, Fla., and April 27-28 in Pollack, La., as well as seeking funding and planning for a South Carolina workshop in September 1995.

**Wildlife Diversity Programs:** Staff promoted the state's Wildlife Diversity Programs through the fifth annual holiday news package; slide programs; and coordination of preserve dedications with local news media. Staff wrote and provided photos for an article for the State Chamber of Commerce magazine "S.C. Business" on the role of business and industry protecting endangered species.

**South Carolina Wildlife magazine:** Section staff provided editorial, research and photographic assistance to South Carolina Wildlife magazine through writing of feature and news articles and coordinating with other agency divisions.

**Freshwater Fishing Records:** The section maintained and promoted the state's freshwater fishing records program gaining new records: Muskellunge in October and smallmouth bass in April.

**Redbreast-Flathead Issue:** Staff assisted the Freshwater Fisheries Section with gathering public input and publicizing a new law related to the Edisto River redbreast-flathead catfish issue where declines in the redbreast populations were found attributable to growing numbers of large flathead catfish not native to the river.

**Law Enforcement Award:** At the request of the department's Law Enforcement Division staff researched and nominated Warden A.L. Reeves (second Audubon warden killed in the nation) who was killed in 1905 near Branchville for National Law Enforcement Officers Memorial in Washington, D.C. Audubon wardens were the predecessors of the present corps of natural resources officers. Surviving descendants were notified.

**State Museum Record Fish Exhibit:** Staff assisted the State Museum and the Freshwater Fisheries Section in developing and making the contacts with record holders for a long-running exhibit on state record freshwater and marine fish and setting up a seminar with a professional bass fisherman to promote the exhibit.

**Walhalla Fish Hatchery:** Staff supported efforts to prevent closing of Walhalla National Fish Hatchery and if necessary get it transferred to state ownership. A video was produced to justify keeping the hatchery open. Staff covered the hatchery with still and video photography and assisted news media with coverage.

**Statewide Officer Hiring:** Staff arranged interviews for the department's legislative liaison with outdoor editors of Charleston, Columbia and Greenville newspapers on a statewide law enforcement hiring proposal.

**Emergency Response:** Three pagers assigned to video and still photographers and news writers to facilitate section response to priority breaking news such as fish kills, oil spills, hazardous weather, etc. The pagers are tied into the 24-hour law enforcement radio room paging system

**1993 ACI Awards Results:** Results were received from the national Association for Conservation Information 1993 competition. Out of 27 entries in the Print News category the

Heritage Trust news package ranked fourth in a three-way tie, and the release on the new mandatory hunter education law ranked eighth. Section writer Pete Laurie's article "Summer's End" in the Sept.-Oct. South Carolina Wildlife magazine ranked first in general interest articles among 31 entries.

**Land Resources:** Staff worked with the division to update exhibits and develop news releases. A document was prepared on the state's conservation districts' 58-year history and achievements for National Association of Conservation Districts time capsule in Washington, D.C. Staff participated in the annual joint conservation conference Jan. 5-7 in Charleston and set up five displays, including a 20-foot division exhibit. Staff coordinated the conservation district auxiliary program activities, including annual business meeting and awards

**Marine Resources:** Staff worked with the division to make the Marine Center more visitor friendly by defining visitor traffic flow, upgrading educational displays, developing two new videos for tour groups on the Marine Center and the marine recreational fisheries stamp program, etc. Staff produced news releases and monthly Marine Update newsletter for the Marine Resource Division and responded to an average of 450 information calls a month dealing with seasons, limits and other department areas.

### **GRAPHICS AND DUPLICATING SECTION**

The Graphics and Duplicating section includes the Graphic Design unit, the Duplicating Center and Mail Room, and acts as the agency's coordinator for all publications. All mail, in-house printing, graphics design and outside printing is coordinated through this section on a large variety of assignments which includes all publications for the department except the *South Carolina Wildlife* magazine and certain special projects or technical reports which are assigned to other sections. This section processes work through requests from each division and is coordinated through Publication Coordinators and a Publications Review Committee. Once a project is approved by a deputy director or committee, work is completed by direct interaction with the requestor, or writer, of the project.

The overall supervision of the section is the responsibility of the Project Administrator. The Publication Coordinator provides day-to-day supervision of all art work and printed documents as well as defines job specifications for procurement. This section's Assistant Publications Coordinator is responsible for editing, proofing, verifying and coordinating internal work flow. In addition to these positions, the Graphics unit includes three graphic artists all of whom assists in the production of agency publications and special projects. The Duplicating Center and Mail Room personnel consist of a Printing Production Manager assisted by two Printing Equipment Operators. Staff performs all in-house duplicating, mail processing/distribution, and courier services.

The objective of the section is to produce and distribute all necessary publications to this agency for: 1) Management, research and law enforcement goals, 2) Protecting and enhancing resources and habitat, and 3) Providing wildlife and fishing and general natural resources enjoyment. Since the Department is required to produce and distribute information regarding hunting and fishing Rules and Regulations and the use of Wildlife Management Areas, this section prepares and updates any publications affecting those activities in the state. Typical of such publications are the annual combined hunting and fishing Rules and Regulations, Turkey Hunting Regulations, the Migratory Bird Regulations and the Wildlife Management Area maps which require updating each year. The section also produces a wide variety of general information on individual wildlife species, management and research facilities, game management techniques, conservation, education, fishing, boating, and recreational outdoor sporting activities.

## MAGAZINE SECTION

Magazine section's function is to publish and promote South Carolina Wildlife, the agency's nationally recognized bimonthly conservation magazine. As one of the main educational and public relations tools of the Conservation Education and Communications Division, South Carolina Wildlife informs the public of the value of the state's diverse natural resources while acquainting them with the agency's programs that protect and manage these resources.

SCW features a balance of articles on outdoor activities, natural and scenic areas, character profiles, conservation issues, wildlife-watching, outdoor humor, and news. As well as extolling the natural resources of the state, the magazine promotes the historical and cultural values of South Carolina and encourages tourism and visitation through such articles as "Myrtle Beach's Outback" (urging both visitors and residents to discover the natural world preserved not far from the Grand Strand) and "Christmas in the Upcountry" (a seasonal look at the evergreen woodlands and rural main streets of the Upstate).

SCW embarked on an exciting venture by joining the program known as SC MAPS, an imaginative approach to teaching about South Carolina's landscape and its shaping of the state's history. Following the signing of a memorandum of understanding by the DNR's director, Dr. James A. Timmerman Jr., and the State Department of Education's Dr. Barbara Nielsen, SCW began providing to teachers, free of charge, packets of mini-magazines that supplemented their classroom use of manuals, large, laminated high-altitude and satellite infrared lithographs, and topographic and special-purpose maps. This popular cross-curricular program uses a hands-on approach to teaching students the unique nature of South Carolina's natural resources and encourages their awareness of the need to conserve and protect these resources.

In addition to this inter-agency cooperative effort, SCW also continued to work with S.C. Parks, Recreation and Tourism, the State Museum, the State Aquarium, and the Department of Commerce to seek mutually supportive methods of promoting public awareness of the state's diverse features and outdoor recreation opportunities.

South Carolina Wildlife again brought recognition to the agency and the Palmetto State for excellence in photography, writing and design through its participation in national competitions. The publication was named top conservation magazine in North America, an award bestowed by the Association for Conservation Information, which brings together journalists and educators from state and federal wildlife agencies nationwide. SCW also won the ACI's first-place award in the Parks article category and took first and second places for best color photography, and first, second and third for black and white photography.

Editorial and marketing/promotions planning moved forward, with staff developing a 12- to 15-month schedule. Circulation of South Carolina Wildlife continued to average approximately 60,000 subscribers, reaching almost 15 percent of South Carolina households. The magazine is provided free to all libraries and schools in the state. New marketing efforts centered on a cash acknowledgment renewal program to help improve renewal response. Additional marketing efforts targeted DNR license holders.

Introduction of new byproducts and aggressive marketing brought increased revenues to some 300 percent during December 1994 as compared to December 1993. The best-selling "Palmetto Portraits" and the "Sportsman's Calendar and Almanac" were published. New magazine byproducts included South Carolina Wildlife's Outdoor Guide, a county-by-county atlas; sporting series and nature series T-shirts and tote bags; Tides and Times; and identification posters for freshwater and saltwater fish. Combination sets of byproducts were test-marketed and proved successful. New book titles, fulfilled through Sandlapper Press, were introduced. New-product development for 1995-96 began.

An agreement was reached with S.C. Parks, Recreation and Tourism whereby SCW products were sold through PRT's park stores and gift shops. Wholesale marketing to retail locations was



begun, with ten stores now carrying SCW merchandise.

Magazine section photography staff, whose primary responsibility is to fulfill assignments for illustrating articles published in the magazine, are also responsible for all still photography used by the agency and regularly provide photo support and expertise to other divisions.

Design and layout of the magazine were fully converted to computer. Computer typesetting for the agency continued to channel through this section, with editorial and graphics staff advising and consulting on various special publication projects. Staff also assisted with other special responsibilities, such as the agency's RESPECT (outdoor ethics) program, the Governor's Cup Billfishing Tournament Series, the Palmetto Sportsmen's Classic, and the department exhibit. Staff also participated in numerous DNR Strategic Planning sessions.

The 8th annual Young Outdoor Writers' Competition was conducted in conjunction with the Harry R.E. Hampton Memorial Wildlife Fund, and winning students' and teachers' awards were presented by Lt. Gov. Robert L. Peeler at the 1995 Palmetto Sportsmen's Classic.

With the ongoing support and counsel of the DNR Board and the CEC Advisory Committee, South Carolina Wildlife magazine looks to continuing its tradition as South Carolina's magazine, one that represents the best interests of the natural Palmetto State.

## **GEOLOGICAL SURVEY**

Prior to State government reorganization of 1994, the Geological Survey was combined with the South Carolina Geodetic Survey; both Surveys were part of the State Budget Control Board. With reorganization the Geological Survey became a Unit within the newly-formed Department of Natural Resources. Larry Cartee, Assistant Director of the Department of Natural Resources, was given the responsibility to oversee the Geological Survey. After Mr. Cartee assumed responsibility for the program, two decisions were made. The first was to conduct a nationwide search to hire a new State Geologist, and the second was to leave the organization of the Geological Survey intact until a State Geologist was hired.

When the Geological Survey became part of the Department of Natural Resources, the unit was divided into two Sections, and each of these sections was supervised by a Geologist IV. Paul Nystrom directed the activities of the Geological Mapping Section and Arthur (Butch) Maybin III guided the Mineral Resources Section. Almost all of the work of the Geological Mapping Section was focused on the producing a set of 1:24,000 Scale geological maps of the Savannah River Site (SRS) and its immediate vicinity. The South Carolina Geological Survey had been selected to conduct the SRS Project when the detail needed from the work could not be obtained from the U.S. Geological Survey. This SRS mapping continues to present and was initially an extension of the Upper Coastal Plain study which has mapped the area between Columbia and West Augusta. Following reorganization the geology of the Williston 1:24,000 scale quadrangle which was part of the SRS project was placed on Open-file at the Geological Survey. The Mineral Resources Section had shifted gears slightly and was into a second year of conducting geologic mapping in Laurens County. This mapping was being funded by Federal STATEMAP Program and began as an extension of mapping of the Vermiculite District, being previously studied by the Mineral Resources Section. During the past year, five (5) 1:24,000 scale geology maps of Laurens County were placed on open-file. Besides the mapping the Mineral Resources Section conducted an active classroom and teacher-workshop Education Program.

Interviews for the State Geologist were conducted in March 1995. Dr. C.W. Clendenin, was selected from a group of more than 30, qualified individuals. Upon his arrival Dr. Clendenin, with Mr. Cartee's approval, reorganized the Geological Survey and redefined the work responsibilities as four (4) project areas. Mr. Nystrom became responsible for Regional Geology and Earthquake Studies, and Mr. Maybin became responsible for Regional Geology and Mineral Resources. Clark Niewendorp, formerly in the Mineral Resources Section, was given responsibility for Geologic Mapping in the Piedmont, and Ralph Willoughby, formerly in the Geologic Mapping Section, was given responsibility for Geologic Mapping in the Coastal Plain. Job descriptions for each of these individuals were subsequently rewritten.

Reassignment of work responsibilities was driven by a new definition of the mission of the Geological Survey. The mission of the South Carolina Geological Survey within the Department of Natural Resources is to provide a service-oriented program which collects, studies, interprets, and reports all information to pertain to the geology and mineral resources affecting the daily lives of the citizens of the State. The purpose of this service-oriented program is to generate a basic understanding of the geologic framework of the State. This particular definition of mission was considered important because, with an increasingly environmentally aware public, the need for economic growth a more applied, short turnaround product product program was needed to better serve the public. Above all the basic geologic mapping program was continued because without this work, no real understanding of earth system can be obtained. Ecosystem management, natural resource conservation and management, proper land use, and environmental regulation are dependent on this fundamental geologic data base as a foundation.

Recognizing that applied geologic map products from the Geological Survey serve as a foundation of many government programs, the Geological Survey is now moving into a variety of areas which include land use and watershed protection, geologic hazards assessment, waste-disposal and clean up problems, mineral resources, and definition of availability of building materials. Under the Department of Natural Resources, the Geological Survey now has a commitment to the State's interests because the need and purpose of geologic information as changed, and the Unit continues to develop a unique capability to serve directly the geologic needs of the State.



## LAND RESOURCES AND CONSERVATION DISTRICTS DIVISION

**TRAINING** - In FY 95 the Division provided for the training of all Division staff in "Total Quality Management Awareness" and an advanced course in quality entitled "Roadmap to Problem Solving" was provided to many Division staff. As a result, a Division Quality Steering Team was developed to direct the quality efforts of the Division.

**COMPUTER NETWORK** - Development and installation of a state of the art computer network in the Columbia office.

**ASSISTANCE TO LANDOWNERS AND USERS** - During FY 1994-95, over 688 staff days of technical assistance was provided by Division staff through conservation districts. Technical duties of staff include assisting conservation districts with planning and installation of soil and water conservation practices (including land treatment watershed projects and implementation of the Clean Water Act), monitoring erosion, sediment and stormwater problems, and demonstration of conservation tillage and drip irrigation. Through conservation programs in the districts more than \$4.874 million in federal cost share assistance has been provided to treat over 93,700 acres. In addition to cost share dollars, annual rental payments to landowners enrolled in the Conservation Reserve Program will total an estimated \$11.5 million for the 269,531 acres placed in the program. 69.3 percent of the total acres of cropland and pasture in the state has adequate soil and water conservation management. There are 35,973 conservation district cooperators. The total acres in South Carolina placed under conservation plans through conservation districts is over 6.65 million with the state's cost per acre held at \$0.16 in FY 94-95.

**CONSERVATION TILLAGE DEMONSTRATION PROGRAM** - The Conservation Tillage program demonstrates an innovative approach to promote the adoption of emerging conservation tillage technology to conserve energy, save time and money, reduce soil erosion and improve water quality. Conservation tillage equipment (no-till drills, planters, and drip irrigation machines) is made available to the general public through the conservation districts. This program allows landusers to test for themselves this proven conservation technology before investing in the equipment. In 1995, the total acres using conservation tillage exceeded 230,000 acres. The Districts Section sponsored field days and demonstrations jointly with conservation districts with assistance from other federal, state, and private agencies. Approximately 30 demonstration/field days were sponsored by the Division and conservation districts this year.

**CONSERVATION DISTRICT COMMISSIONER AND WATERSHED DIRECTOR ASSISTANCE** - The Division provides administrative and technical assistance in the implementation of the Soil and Water Conservation Districts Law and the Watershed Conservation Districts Law. Division staff attended 435 conservation district board meetings providing direct assistance to the district commissioners, district employees and other citizens. There are 37 Watershed Conservation Districts in the state with a combined total of 1,232,654 acres. Division staff provided direct assistance such as training watershed directors and providing administrative assistance.

**BUILDING DISTRICT CAPACITY** - Division staff, district commissioners and district employees completed the Building District Capacity Workshop, conducted by the National Association of Conservation Districts (NACD). The five-day workshop was an exercise designed to identify the programs of the conservation districts and assess the current work, identify areas for improvement and set and prioritized goals with action plans. South Carolina was one of twenty states featured at NACD's Building Conservation District Capacity Showcase held in Reno, Nevada. The Showcase was an opportunity for states to exchange ideas and methods used to build a successful conservation program delivery system through the local conservation districts.

**TOTAL QUALITY MANAGEMENT (TQM)** - Ten TQM-Awareness Training Sessions were held

around the state for all Division Staff, conservation district employees and the USDA-Natural Resources Conservation Service (NRCS). The second phase of TQM, Roadmap To Problem Solving, will be conducted in the spring of 1996. The TQM-Quality Steering Team has appointed two Quality Improvement Process (QIP) Teams to address specific issues.

**CONSERVATION DISTRICT COMMISSIONER and DISTRICT EMPLOYEES TRAINING -**

The Districts Section conducted special training workshops for the 230 conservation district commissioners, including technical workshops, demonstrations, and field days on new and innovative conservation practices and technologies. Two training sessions were held for conservation district employees. These sessions were well attended and productive.

**REGIONAL SCIENCE FAIRS AND JUNIOR ACADEMY OF SCIENCE -** Conservation District Commissioners and Agency staff served as judges for the seven (7) **Regional Science Fairs** held throughout the State and for the **Junior Academy of Science** in the natural resource category. Savings bonds and certificates were presented to the first and second place winners in both the Junior and Senior divisions.

**ENVIRONMENTAL EDUCATION INSTITUTES FOR TEACHERS -** The Districts Section, in cooperation with conservation districts, co-sponsored seventeen (17) Environmental Education Institutes for Teachers. The Institutes were held in cooperation with local school districts and covered many topics related to environmental education. These Institutes offered teachers an excellent opportunity to learn about the environment and conservation education services available to the community. Over 350 teachers participated in the environmental institutes and earned re-certification or graduate credit.

**TEACHING KIDS ABOUT THE ENVIRONMENT (KATE) -** Division staff provided assistance in the development and implementation of this program, produced curriculum for the soils portion of the program, and provided training for instructors to teach the soils portion of the program. The KATE program emphasizes the interrelationship of soils, water, forests and wildlife. 13,388 students participated in the program in FY 1994-95. The coalition is a unique approach to natural resource education utilizing the collective talents and resources of public and private agencies and businesses.

**CONSERVATION WORKSHOP FOR YOUTH -** Staff of the Conservation Districts Section conducted the annual conservation workshop which is held on the Clemson University campus. Approximately 100 high school students from across the state attend the week-long activity. The participating youth are sponsored by their local conservation district. During the workshop, the youth were informed of the importance of land and related natural resource conservation and were prepared to serve as youth commissioners in their local districts. Six scholarships were awarded to participants who excelled in workshop activities.

**BARRIER ISLAND COASTAL ENVIRONMENTAL WORKSHOP -** The Barrier Island Coastal Workshop, held at Camp St. Christopher, south of Charleston, is a weekend workshop for high school students to study the coastal environment. The workshop includes sessions on ocean life, beach formation, marsh and wetland ecology. Participating students are sponsored by their local conservation district. The Workshop is coordinated by Division staff.

**STATE CONSERVATION SPEAKING CONTEST -** Conservation Districts held local conservation speaking contests in preparation for the four area speaking contests which were held at various locations around the state. The Conservation Speaking Contest is open to all students in grades 9 through 12. The topic for 1994-95 contest was Water Conservation. The four area winners compete for the state award at the South Carolina Association of Conservation Districts Conference in January.

**ESSAY CONTEST -** This annual statewide contest is sponsored by the Districts Section through the 46 conservation districts and school districts for grades 5-8. The 94-95 theme was "Why is Water Conservation Important". The Districts Section obtained the services of the SC

State Library to prepare a bibliography of water quality reference publications and provided the bibliography to conservation districts for use with schools. Participating students write several thousand essays each year in the conservation essay contest.

**POSTER CONTEST** - This annual statewide contest is sponsored by the Districts Section through the conservation districts and school districts for grades K-4 each spring. The 94-95 theme was "Water For a Thirsty Planet". The creation of the poster is a class project designed to promote the benefits of group effort and participation. This competition is conducted in cooperation with the South Carolina Wildlife Federation.

**EDUCATION AND PUBLIC INFORMATION PROGRAMS** - Division staff and conservation districts conduct an extensive education and public information program on natural resource conservation. With a network of forty-six offices, one in each county, the conservation districts make available timely and important information to the public. During FY 94-95, the Division and conservation districts have reached approximately one million citizens through various methods such as news releases, workshops, exhibits, classroom presentations, and demonstrations.

**AWARDS** - The Agency recognized the achievements of individuals and businesses that have been good stewards of our natural resources through awards and recognition programs such as the **Clean Water Farmer Award, Land Development Stewardship Award, Outstanding Conservation Teacher Award, and the Outstanding Conservation District Commissioner Award.**

The Greenville Conservation District has been named recipient of the Southeastern Regional Award for Conservation Education by the National Association of Conservation Districts (NACD). The Greenville program also received NACD's second place national award for conservation education. Highlights of the Greenville program include a monthly environmental education seminar for teachers; a stormwater management education program for engineers; a non-point pollution control exhibit and a comprehensive education program for students and adults of all ages.

The **PLANNING AND POLICY SECTION** of the Land Resources and Conservation Districts Division provides a wide variety of land resource information and conservation planning assistance. Section staff collect and analyze information on the existence and use of the State's land-based natural resources and disseminates this information in the form of resource studies, inventories, maps, and direct public assistance. Staff works with the general public, government agencies, private companies, and conservation organizations and other land users to collect, disseminate, and apply resource data to promote wise land management decisions, sustainable development, and effective resource planning efforts in the State.

**LAND RESOURCES INFORMATION CENTER (LRIC)** - The LRIC, established in 1977, is the state affiliate of the U.S. Geological Survey's (USGS) Earth Science Information Center (ESIC). This Center is a public outlet for resource information and is a vital source of data for planners, resource managers and the general public. The resources of the Center are utilized to promote land conservation and inform the public on available map and photo products and their applications. The Center provides products such as topographic maps, nautical charts, aerial photographs, digital data, National Wetlands Inventory (NWI) maps, lake and special purpose maps and other information. In addition, professional staff provide expertise and guidance to individuals in project planning and referrals for other related information. The scope of services and products available through the Center were expanded during FY '94 - '95 to include:

- The development and partial implementation of a promotional plan to allow for increased awareness of the services of the LRIC and the application of available information for wise land management and resource planning decisions. Exhibits were utilized at various events, which included the Myrtle Beach Wildlife Exposition, the Southeastern Wildlife Exposition, Palmetto Sportsman Classic, Annual Conference of the S.C. Chapter,

American Planning Association, etc.

- The LRIC provided promotional products and staff assistance in the establishment of regional Land Resource Information Centers in Greenville and Moncks Corner to provide more localized cartographic and planning related assistance.
- Two (2) editions of the Land Resource Information Center Bulletin were distributed to an expanded mailing list during FY '94 - '95.
- Approximately 10,000 individuals interacted with the Center during FY '94-95 and received assistance, information, and/or products for various cartographic and resource planning needs.
- Prepared new cooperative agreement with USGS on the operation of the Center.
- A full time temporary cartographic assistant was employed by the Center to help meet customer expectations.

**NAPP PROGRAM** - The Division coordinates the National Aerial Photography Program (NAPP) for the State. This federal-state USGS sponsored cost-share program, offered every five years, is a cooperative public and private sector effort in South Carolina to acquire a statewide set of high altitude color infrared aerial photography and to offer a wide range of photographic products to the public through the LRIC. This program involves the financial cooperation of 27 public and private organizations. There is a total of 4,700 nine-inch square film images, with each separate exposure capturing 32 square miles of terrain. The rigid specifications of this aerial photography program make it one of the best in the nation, producing high resolution, high quality color infrared enlargements for a wide variety of uses. Significant achievements in the program include:

- The most recent NAPP Program was flown January-March 1994 with the program becoming fully operational to the public June 1994.
- NAPP orders are ordered through the Section's LRIC. The Center provide assistance in image interpretation, project development and ordering. Products include a variety of custom scale corrected enlargements, contact prints and contact films, mosaics, and digital versions.
- Nine private and public organizations have invested in total statewide NAPP coverage. These include land and water divisions of DNR, Westvaco, SCE&G, SCDHEC, SCDOT, SC Forestry Commission, US Fish and Wildlife Service, and the USDA Natural Resources Conservation Service (NRCS). DNR's Marine Center and OCRM acquired coastal county coverage; and the US Forest Service, SC Regional COGs, and DNR Fisheries Division have invested in significant regional NAPP coverage.

**SCMAPS PROGRAM** - The Division continued to expand and coordinate the South Carolina Maps and Aerial Photography Systems (SCMAPS) Program. The Program is the only multi-discipline educational program in South Carolina schools approved and coordinated by the Department of Education. SCMAPS is a three-way venture designed and implemented by the S.C. Department of Education, S.C. Department of Natural Resources and Clemson University. The Program is designed around map products with curriculum activities developed for Ecology, Earth Science, Social Studies, History, Math, and Literature. Section staff assist in the coordination and teaching of SCMAPS workshops, serve on the Advisory Board, and coordinate the compiling and distribution of maps and photography products that make up the SCMAPS teaching packages. Major accomplishments include:

- Designed and contracted printing of twelve custom designed maps for the program.
- Conducted a series of workshops for teachers to establish SCMAPS Training Teams in each of the 13 Regional Science and Math HUBS.
- SCMAPS was chosen to be included in The State's School Book Adoption Program making this curriculum easily accessible through the State's 91 school districts.

- SCMAPS has added literature and mathematics components to the curriculum making it the first total interdisciplinary program for middle schools in South Carolina.
- The South Carolina Wildlife Magazine has developed an added component to SCMAPS that includes magazine supplements and curriculum. This resource is provided to SCMAPS teachers six times a year which provides natural resource educational opportunities for these teachers on an ongoing basis.
- SCMAPS has provided a basis from which other programs and projects have been developed. Section staff have provided support for several grant proposals based on the SCMAPS Program. These efforts include:
  - Securing a grant from the Duke Power Foundation to develop an “energy” component and site for SCMAPS.
  - A Clemson secured grant to develop a college curriculum Earth Science Program based on SCMAPS study sites for USC and Clemson University.
  - A Clemson secured National Science Foundation Grant to expand the SCMAPS concept to the Southeastern Region. This program will be called SEMAPS.
  - A DNR secured EPA Grant with the Waccamaw Science and Math HUB entitled “Watershed Investigations for Middle Schools.” The project involved teacher teams from 15 schools in Horry and Georgetown counties. A three-day workshop was given at Brookgreen Gardens relative to soils, land use, methodology and environmental engineering.

**PLANNING OUTREACH PROGRAM** - During FY '94 -'95, the Division continued to provide and expand its information, planning services, and technical assistance to local and regional governments, with an emphasis on natural resources protection.

- The Division employed an experienced professional planner during early 1995 who has placed increased emphasis on planning initiatives.
- Further cooperative efforts with the ten Regional Councils of Government were assured through the execution of a Memorandum of Understanding. The Division hosted senior planning and geographic information system staff from the ten Councils for an overview of LRIC, SERSC, and other Division programs to further familiarize them with information and assistance available from DNR. The scope of services discussed included natural resources-related information, such as GIS and remote sensing, conservation planning outreach, project planning and development, and the identification of problems and solutions at the regional level.
- The Division provides input and guidance to local governments in complying with the SC Local Government Comprehensive Planning Enabling Act of 1994, particularly in the area of the natural resources element of the local comprehensive plans. The Section arranged a meeting with staff of various Divisions of DNR and other agencies, and representatives of the Central Midlands Regional Planning Council to assist them in compiling needed information for a pioneering effort to prepare certain elements of local comprehensive plans on a regional basis.
- Staff have participated in the DNR's strategic planning process and have provided relevant input on natural resource planning issues for the Department and the State.
- Co-hosted, along with the Water Resources Division and the Central Midlands Regional Planning Councils of Government, a satellite downlink site for the National Teleconference on Sustainable Communities. The Section also co-hosted the Lovable Communities conference of the South Carolina Downtown Development Association, and the Palmetto Greenways Initiative's conference.

**CONSERVATION PLANNING PROGRAM** - During FY '94-'95, the Division continued to build on conservation programs of benefit to land managers and developers. Special emphasis was



placed on expanding the awareness of land stewardship development concepts.

**STEWARDSHIP DEVELOPMENT PROGRAM** - The Division has developed the Stewardship Development Program to recognize annually those development projects in South Carolina which have done an outstanding job of blending natural resources protection and enhancement into their project design and management. A stewardship development sign and logo will be utilized by those projects chosen for this recognition to advertise their achievements. A Stewardship Development Advisory Board composed of 17 co-sponsoring representatives of public and private organizations provides overall direction to this program and serve as a judging committee for project selections. The Stewardship Development Program provides opportunities for developers to receive DNR suggestions and guidance for the incorporation of natural resource protection within their development planning and management goals. Projects recognized during FY '94-'95 included:

Spring Island Project, Beaufort County; West Ashley Bikeway Project, Charleston; Plant - A - Palm Program, Isle of Palms; and the Xeriscape Interpretive Garden, Hilton Head Island.

**LAND RESOURCE INFORMATION** - The section continued the collection, analysis and distribution of cartographic, earth science and natural resource information to support Division goals and meet requests from the public. Activities include:

- Completed an updated version of the Aerial Photography Guide of South Carolina. The 200-page guide and inventory were printed and distributed to state resource managers and other requestors. This guide is available to the public through the LRIC.
- Prepared a "Topographic mapping status report for South Carolina" to explain the need and promote the updating of topographic maps in South Carolina.
- Began an inventory of DNR-owned lands in the State and development of a GIS of general map boundaries. Staff reviewed DNR deeds, plots, maps, and visited county courthouses to obtain records for this inventory.
- Maintained and updated computer resource databases to meet program and public requests. Databases included: Topographic mapping status, Geographic names, Aerial photography inventory, Map and chart reference file, Environmental contacts directory, and Resource managers and planners mailing lists.

**SOIL SURVEY PROGRAM** - The Land Resources and Conservation Districts Division of DNR is a cooperator, with USDA-Natural Resources Conservation Service (NRCS) and the South Carolina Agricultural Experiment Station, in the National Cooperative Soil Survey Program. Soil surveys provide valuable information on the State's soil resources, which is essential for land use planning, economic development, wetlands identification, soil and water conservation, agricultural operations, and wide variety of other uses. During FY '94-'95 accomplishments included:

- The Division employed the State Soil Scientist during early 1995, who coordinates the Division's responsibilities related to the Soil Survey Program. The State Soil Scientist provides technical soils expertise for various DNR applications such as environmental reviews/site evaluations, and general assistance to the public in the interpretation, analysis, and uses of soil survey information, including education, training, and computer analysis and assistance in the coordination of the Soil Classifiers Registration Act and the Soil Classifiers Advisory Board.
- The Section employs a full time Soil Cartographer, who transferred approximately 1,060,000 acres of soil information as a necessary step in the printing and computerization of South Carolina Soil Surveys. The majority of this acreage was for Horry County and a portion of Bamberg county.
- In a continuing effort to build public awareness as to the value and use of available soils information, educational programs for both adults and youths have been developed and

implemented. These include teacher workshops, seminars, additions to the SCMAPS Program, and magazine articles.

- Numerous requests for specific soils and land use information by phone, walk-ins, and site visits have been answered by the State Soil Scientist. These inquiries came from local governments, federal agencies, other state agencies, utility companies, environmental consultants, private citizens, school children and teachers.

**RESOURCE TECHNOLOGY AND DIGITAL MAPPING** - This program coordinates the Southeastern Remote Sensing Center (SERSC) and a strong partnership with the USC Geography Department's Remote Sensing Laboratory. The SERSC serves as a clearing house for digital, computer-based mapping information outreach to planners, land managers, environmental groups, universities, researchers and the public. Major accomplishments for FY '94 - '95 include:

- Operation of the Southeastern Remote Sensing Center providing satellite image and aerial photo analysis support to a number of partner organizations regionally;
- A second year of change analysis for Charleston metro area over a 20-year period including image rectification and classification for the mapping of urban growth as well as meeting with local planners to exchange and transfer data;
- Continuing database support of the Charleston Harbor Project's digital scanned, color infrared air photo information layer of the 120-photo estuarine study area, including additional image products and scientific user community assistance;
- A statewide 17-category (7 wetland classes) land cover map and rectified Landsat image database for use by the USEPA Wetland Planning Unit and the SCDHEC Wetland Tracking Program;
- Continuing support of the Congaree Swamp National Monument's resource management and research program including assistance in use of a database developed last year for the Park Service;
- Conducted a SPOT satellite imagery users group meeting in conjunction with a NAPP aerial photography user group meeting to present information on uses of image data in GIS Projects and digital mapping programs.
- Conducted image mapping of land cover characteristics for the Savannah River Basin as part of a DNR effort in support of a USEPA two-state project in Georgia and South Carolina.
- Participated in the annual NOAA Coastal Change Analysis Program meeting in Beaufort, North Carolina, and was invited to enter into a cooperative project of land cover mapping using satellite imagery to determine coastal change.

**ENVIRONMENTAL REVIEW PROGRAM** - The Division has provided responses to environmental reviews for many years. This process was refined as part of the DNR Environmental Review program beginning July 1, 1994. The Division has assigned one full time staff person to the environmental review process. Between July 1, 1994 and June 30, 1995, the Land Resources Division received and commented on 297 projects. Field visits were conducted on 49 sites and the Division was assigned as the DNR lead to coordinate the Department's response on 36 designated projects. During early 1995, the Division employed a Professional Civil Engineer, Planner, and a Soil Scientist. The expertise provided by these individuals has provided a well-rounded team approach to the division's input into DNR's environmental review process.

**NATIONAL FLOOD INSURANCE PROGRAM** - The Section's National Flood Insurance Program (NFIP) office serves as a liaison between the Federal Emergency Management Agency (FEMA) and the 180 towns and counties in the state that participate in the program. A staff of three persons work with the 221 communities identified as having areas of special flood hazard by the

Federal Emergency Management Agency. During Federal FY '95 funding period, 4 communities were visited to evaluate community enforcement and compliance of flood damage prevention regulations; ordinance assistance was provided to 24 communities; six local official workshops were held; and three newsletters were published and distributed to 600 local officials, emergency management coordinators, and chief executive officers. Over 1350 requests for information were received and processed. Forty-three of the 46 conservation districts are distribution points for providing flood insurance maps to a variety of individuals, including appraisers, real estate agents, mortgage lenders, insurance agents, surveyors, engineers and local floodplain management officials. Over 350 people attended training courses coordinated by NFIP staff on floodplain management issues. Six new communities joined the NFIP during the year. Flood policies in effect rose 13% since February 1994.

**CAMPING CREEK/BUSH RIVER AGRICULTURAL WATERSHED PROJECT** - A three-year project was started in the Camping Creek/Bush River Watershed in Newberry County to provide education, training, technical assistance and demonstrations for farmers on the management of fertilizers, pesticides and land application of animal wastes. The watershed is one of the priority areas identified in the state Nonpoint Source Pollution Management Plan for implementation of Best Management Practices to prevent nonpoint source pollution. Activities included workshops, development of nutrient management plans, development of a computer expert system to assist farmers with selection of pesticides for use on cropland, development of a local nutrient testing program for poultry litter used as fertilizer to assist farmers with reducing commercial fertilizer use, and demonstration of the proper pumping of animal waste from lagoons and applying it to agricultural land for fertilizer. The project is being conducted in cooperation with Newberry Conservation District, Clemson University, S.C. Department of Agriculture, USDA Natural Resources and Conservation Service and S.C. Poultry Federation. In April 1995 approximately 60 farmers and other natural resource professionals attended a workshop/demonstration of the lagoon pump out and irrigation equipment. In addition to conducting project activities, the Agency is responsible for insuring that the other project participants fulfill their obligations, including performance of duties, submittal of progress reports, and compliance with reimbursement procedures.

**SANTEE RIVER AND COASTAL DRAINAGE NAWQA** - Division staff served on the Santee River and Coastal Drainage National Water-Quality Assessment liaison committee which is a water quality assessment program led by the U.S. Geological Survey. The Goals of the NAWQA Program are to describe the status and trends in the quality of the surface-water and ground-water resources and to provide a sound, scientific understanding of the primary natural and human factors that affect the quality of these resources and provide useful information to policy makers and managers at the national, state, and local levels.

**COASTAL NONPOINT SOURCE POLLUTION CONTROL PROGRAM** - The Division continued to assist with development of the state's coastal nonpoint source pollution control program which is required by Section 6217 of the 1990 Federal Coastal Zone Act Reauthorization Amendments (CZARA), at the request of the Office of Ocean and Coastal Resources (OOCR) with the S.C. Department of Health and Environment Control. The program is administered at the federal level by the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Environmental Protection Agency (EPA). The coastal program must provide for implementation of measures to prevent NPS pollution of coastal waters. The program may include a state regulatory enforcement mechanism to require land users to implement pollution control measures. Other mechanisms may include state programs for technical assistance, education and additional activities. Section 6217 encourages use of existing state legislation authorities and programs when feasible.

The Division worked most closely with the development of the agricultural portion of the

coastal NPS program along with other agencies, farmers and organizations. The focus of this effort was on how the agricultural program could be implemented to meet environmental needs, comply with the CZARA requirements, and place the least possible hardship on farmers and agencies in the state. NOAA and EPA were receptive to OOCR recommendations that the Agency and conservation districts have a significant role in implementation of the coastal agricultural NPS program. The overall coastal NPS program was developed by OOCR for submittal to NOAA and EPA , and no response has been made at this time by NOAA and EPA.

**LAKE AND WATERSHED ASSOCIATION OF SOUTH CAROLINA** - The Division worked with the Lake and Watershed Association of South Carolina (LWASC) to conduct public education on the relationships between land and water management as a component of comprehensive environmental planning and management. LWASC is a state chapter of the North American Lake Management Society (NALMS). The purpose of LWASC is to promote understanding, protection and comprehensive management of lakes, reservoirs and their watersheds. A staff member served as President of LWASC.

**NEWSLETTER** - The Division published a newsletter, THE NONPOINT SOURCE, to disseminate information on NPS issues and projects among agencies and the public. Agencies participating in the State Nonpoint Source Management Program contributed articles. The newsletter has a circulation of approximately 3,000, including industry officials, citizen groups, individuals, conservation district commissioners, professional organizations, newspapers, television and radio stations, libraries, state and federal legislators, and state, local and federal agencies.

**SUSTAINABLE AGRICULTURE INITIATIVE** - The Division developed an initiative on sustainable agriculture to promote agricultural practices that are environmentally sound, economically feasible, and meet food and fiber needs. The initiative places a sustainable agriculture focus on existing agency programs on conservation tillage, drip irrigation and nonpoint source pollution control, and it expands the Division's participation with other agencies and organizations. Activities during the year included conducting sustainable agriculture training in conjunction with Clemson University for Extension Service and other state and federal natural resource agency personnel, and conducting a sustainable agriculture conference in January 1995 in conjunction with the South Carolina Sustainable Agriculture Network. A staff member served on the steering committee of the network which includes a variety of groups and individuals interested in sustainable agriculture issues in the state. Planning and publicity was provided for the Carolina Farm Stewardship Association's (CFSA) Annual Sustainable Agriculture Conference at Winthrop University in November 1994. CFSA includes farmers and other individuals and organizations from North Carolina and South Carolina.

**LANDSCAPE ARCHITECTS** - The Department is responsible for the registration of Landscape Architects under the authority of the Landscape Architects Registration Act, Chapter 40-28-10 of the SC Code of Laws of 1976, as amended, and is advised and assisted by the Landscape Architect Advisory Council. The purpose of the Act is to protect the health, safety and welfare of the public through the registration of qualified professionals. Staff provided for annual registration renewals, investigated complaints and assisted the Landscape Architect Advisory Council. A directory of registered landscape architects and a brochure on the program are available to assist the public in understanding the role and the qualifications of the professional landscape architect in South Carolina. Currently, 419 Landscape Architects are registered, and 65 firms hold Certificates of Authorization in South Carolina.

**LANDSCAPE ARCHITECT REGISTRATION EXAM (LARE)** - The Department is a member of the national Council of Landscape Architectural Registration Boards (CLARB) and administers the national registration exam. CLARB prepares and evaluates the national registration exam for landscape architects. The entire exam is offered in June of each year and the performance

sections are offered again each December. This national registration exam is administered by 44 states, British Columbia, and Ontario. These boards regulate the profession of landscape architecture. The Department proctored 15 candidates who sat for 50 separate sections during the three-day session of the June exam. During the two-day December session, 25 candidates sat for 50 individual sections of the exam.

**LANDSCAPE ARCHITECT ADVISORY COUNCIL** - The Department appoints a five (5) member Landscape Architect Advisory Council composed of professional landscape architects with a minimum of five (5) years experience to assist the Department.

**SOIL CLASSIFIERS** - The Department is responsible for the registration of Professional Soil Classifiers under the authority of the Soil Classifiers Act of 1974, as amended. Currently, 33 professionals are registered in South Carolina. The purpose of the Act, through examination and licensing, is to ensure competence and professionalism in the field of soil classification. Staff conducted the annual registration renewals, assisted the Soil Classifiers Advisory Council, and served as a liaison with other agencies.

**SOIL CLASSIFIERS ADVISORY COUNCIL** - The Soil Classifiers Advisory Council membership is composed of five (5) registered soil classifiers who are appointed by the Department.

## **LAW ENFORCEMENT DIVISION**

### **FIELD OPERATIONS**

The Law Enforcement Field Operations is primarily responsible for enforcement of the freshwater fish, game, commercial fisheries, boating, and littering laws of South Carolina. At the present time, we have 247 DNR Enforcement Officers throughout the state.

These officers patrol 31,000 square miles comprising the lands and waters of the state. Also, Enforcement Officers patrol more than nearly 200 miles of coast line and 3,000 miles of river shore line. Our coastal officers are also deputized by the National Marine Fisheries Service , which expands their authority beyond the three mile territorial boundary line. Specifically, we enforce laws on reefs and wreck systems that the Marine Resources Division builds and manages. In addition to the many man hours spent enforcing game, fish, boating, and trespass laws, enforcement officers have the responsibility for the enforcement of the Wildlife Management Area Regulations, protecting our Heritage Preserves and the development and presentation of hunter education and boating safety programs.

Special enforcement efforts were focused on all violations that affect the resource. Some of the areas where enforcement increased were night deer hunting, illegal deer harvest, illegal baiting for deer, turkey, doves and ducks, trespassing to hunt and fish, and saltwater fisheries activities. The general breakdown of cases were as follows: Game/Fish-4,802; Boating-2,529; Commercial-561; Other-250 and Warning Tickets-5,230; for a total of 13,372.

For Fiscal Year 1994-1995, Enforcement Officers expended approximately 4,607 hours assisting other Law Enforcement agencies with man hunts, drug raids, marijuana eradication, security details, and other related activities. They also presented 477 programs to schools, civic groups, and sportsmen groups. They conducted many search and rescue missions resulting in the expenditure of over 3,754 man hours.

The Division assisted in the organization and production of 17 successful fishing rodeos for our "Get Hooked on Fishing, Not on Drugs" campaign throughout the state. These rodeos introduce thousands of children and adults to the joy of fishing in our Palmetto State.

### **OPERATIONS AND INVESTIGATIONS**

South Carolina is ranked 8th in the country in the number of registered motorboats with 397,000. This number continues to grow each year as more people take to the water for fishing, hunting and recreation. The job responsibilities of this section consist of boating and hunting accident investigations, aids to navigation, waterway hazard removal, search and rescue (divers) operations, marine event applications, zoning and regulatory waterway investigations, and waterway construction applications and investigations.

**Boating Accident Investigation** - This section is responsible for processing all boating accident reports, investigating accidents that involve fatalities or serious injuries, and forwarding the information gathered to the United States Coast Guard. This section consists of one officer. Last year there were 159 boating accident reports reviewed and processed. Included in those reports were 30 fatalities. A study of accident reports show that 75% of all persons involved in fatal boating accidents have had no formal boating safety training. Therefore, resources should be used to reach those boaters in the field and classroom in an attempt to provide a safer boating environment.

**Aids to Navigation** - A total of 1,000 aids to navigation and regulatory markers are maintained by this section. These buoys mark hazardous sites and regulated areas on the waters of the state and must be inspected on a regular basis. It is the objective of this section to expand the maintenance and inspection program to keep pace with the growth in boating. During 1995 over

400 aids to navigation and regulatory markers were replaced, and 100 information signs were distributed. Moreover, routine inspections and verification of positions must be conducted every month. Currently there is one officer in charge of this job responsibility with help from other officers when possible.

**Waterway Construction Permit Investigations** - Investigations of waterway construction sites to ensure that they do not affect navigation has taken on an even greater importance with the increase in the number of registered boats. Currently there is one officer responsible for these investigations.

**Zoning Investigations** - Zoning investigations are conducted as a result of an official request from a member of the public, or one of our enforcement officers believes an area needs to be zoned SLOW TO NO WAKE. Section personnel investigate each complaint thoroughly, and zoning is recommended only if other means will not correct the situation. The utilization of information signs pertaining to wake responsibility in certain areas instead of official regulation has been very successful. There were 79 investigations this year. These requests seem to increase from year to year and take up a large portion of the work time. There is currently one officer conducting these investigations.

**Hazard Removal** - Another area of responsibility is the removal of boating hazards. In this area divers use a specialized underwater chain saw to remove boating hazards such as stumps and logs. With the removal of these hazards it is no longer necessary to mark these sites with buoys. This saves on time and monies that would have been spent in the maintenance of hazard markers. This section is staffed by officers responsible for other duties, who also perform these tasks when possible.

**Divers (Search & Rescue)** - The department's law enforcement dive team is composed of officers from various law enforcement districts. These positions are voluntary and involve hundreds of hazardous work hours for these officers each year. The dive team is responsible for searching for drowned persons as well as assisting SLED and other law enforcement agencies in searching for evidence of a crime that may have been thrown into the water. Last year the dive team participated in 54 dive assignments.

**Marine Events** - Authorization to hold approximately 550 marine events were issued by staff during the year. These events include regattas, boat races, fishing tournaments, parades, etc. These permits are monitored for safety reasons and also to avoid multiple events occurring in the same area simultaneously. Staff is responsible for reviewing and authorizing these events. Currently one of the education officers along with staff are working in this area.

**Education** - Officers assigned to this program are responsible for conducting all hunter and boating education programs/seminars in their designated area. Each officer has been assigned 4-5 counties in the geographical area in which they live.

On July 1, 1995, it became a requirement for all persons born after June 30, 1979, to successfully complete a hunter education course approved by the SCDNR. The transition from a voluntary program to mandatory compliance has gone as planned. A variety of media outlets have been used to advertise the requirement to the public. Hunter Education programs have been offered statewide at a variety of locations, and have been taught by both full-time and volunteer instructors. In addition, four programs were broadcast over SC ETV satellite link to Clemson Extension offices statewide. A total of 318 programs have been presented, resulting in 10,601 students certified from January 1, 1995 to December 1, 1995.

A statewide course to certify volunteer and full-time instructors as muzzle loading education instructors has been completed. This course was taught by certified instructors from the National Muzzle loading Rifle Association.

Incentive awards (golf shirts, tee-shirts, and caps) that display SCDNR Volunteer Instructor have been distributed to volunteer instructors.

## **OPERATION GAME THIEF**

This section was created in 1983 in order to provide cash rewards for individuals who provide information concerning violations of wildlife laws and attendant acts of vandalism. Approximately 2,040 calls that concerned unlawful acts were recorded during Fiscal Year 94-95. These calls resulted in a total of 225 cases with a conviction rate of 90%.

We continue to monitor the cases which originate in the district offices in an effort to get a better picture of public response to our program.

## **MARINE THEFT**

This section was started in October of 1978 in order to apprehend individuals who steal marine equipment, file fraudulent insurance claims on stolen boats and motors, making false affidavits and to assist local, state, and federal law enforcement agencies with information and training on marine theft matters.

This section recovered 23 stolen boats, 17 stolen motors and 5 stolen trailers. There were 405 cases reviewed and investigated. A total of 22 convictions for criminal cases were made.

## **COVERT OPERATIONS AND INVESTIGATIONS**

Covert Operations within the SCDNR Law Enforcement Division began as a formal working unit in 1984. The unit currently consists of seven (7) officers reporting to the District Captain in their respective districts. The coordination of this section is currently the responsibility of the Major of Field Operations.

The primary function of the unit is working long and intermediate term investigations involving the illegal commercialization of fish, game, non-game, and saltwater species. Increasingly, the unit is focusing more on the illegal commercialization of wildlife. Currently, some of the live species that are of concern include coyote, fox, turkey, deer, hogs, bear, grass carp, game fish, piranha, and reptiles.

The unit also conducts one time buy/busts involving the illegal commercialization of wildlife. Short term investigations into illegal hunting and fishing activities, and chronic violators are also conducted often in conjunction with uniformed officers. Finally, the unit has expanded into investigations of hunting and fishing license fraud and violations that are not specifically wildlife related, such as violations of the United States Department of Agriculture and Title 16 Fraud violations. The unit has been hampered in conducting long term operations due to budgetary constraints, however investigations continue under limited travel restrictions.

The primary focus of the unit over the past fiscal year has been on investigating commercialization complaints, assisting officers within their area on localized problems and offenders, assisting other agencies on cases within their area, and collecting information on commercial activities. The unit was also utilized for investigations not usually associated with covert work including, background investigations, an internal investigation, and an investigation resulting from a civil action involving the Department.

Last fiscal year the unit initiated three long term, multiple subject, investigations related to the illegal importation, buying, and selling of wildlife. The investigations are ongoing and two are being done in cooperation with federal authorities. Short term investigations included three cases of the commercialization of live foxes, two cases involving captive cougars, three license fraud cases, and a hunting lease fraud case. The unit assisted on cases involving theft of commercial crab pots, tampering with commercial devices, chronic trespassing, night hunting, and illegal herring fishing.



## **DIVISION OF MARINE RESOURCES**

The Division of Marine Resources provides both short-term and long-range solutions to coastal issues by conducting research projects to analyze conditions in the commercial and recreational fisheries and to determine the effects of fisheries management efforts. The Division explores new and promising fishing technology for new and expanded fisheries and other developments in seafood production and actively investigates environmental and ecological concerns, especially those affecting fisheries habitat. The Division also provides ongoing research to fulfill the goal of fostering a seafood farming industry throughout the state's coastal area through programs at the James M. Waddell Mariculture Research and Development Center and serves as the state's mission-oriented research center in the area of marine resources in general.

### **COASTAL INFORMATION EDUCATION & COMMUNICATIONS OFFICE**

This office provides broad based informational, educational and public affairs support to all agency coastal programs and activities, including those of the Division of Marine Resources, Division of Conservation Education and Communications, Division of Law Enforcement and Boating, Division of Administration and Support and the Executive Office. It is recognized that the largest coastal programs are those of the MRD. Support includes production of news releases, coordination of media relations, the production of special publications, writing SCW magazine articles, dispensing public information, conducting Center based tours and educational cruises, performing educational outreach activities, implementing the Speaker's Bureau, development of interpretive literature and facilities, field editing of the agency's semiannual newspaper, conducting special agency functions and other appropriate activities. It is also the mission of the Coastal Information Education and Communications Office to inform and educate the citizens of South Carolina about:

- the tremendous ecological diversity and economical value of South Carolina's natural coastal resources
- what the Agency is doing to better understand, manage and conserve these resources
- the expertise we use in our management and research endeavors and
- what user groups can do to protect and conserve these resources.

This office processed more than 50 news releases during the reporting period, covering Marine Resources Division activities and the District 9 Coastal Law Enforcement.

Coverage included periodic stories such as announcing various fishery season opening, public meetings, seminars, regulations and other routine topics. In addition to routine, recurring stories, an ongoing effort is also made to report project activities of the Marine Division and the District 9 Coastal Law Enforcement at every opportunity. The news desk also routinely assists with promotion of the Governor's Cup Billfishing Series, Harry Hampton Banquet, the Marine Division's biannual Fishing Fair and other events and programs that require public notice and promote participation.

Photo coverage was also provided for special events and when possible for research, monitoring and management projects. An example during the reporting period was a shark research cruise when a news desk photographer spent three days at sea covering in detail the project's work photographically.

The news desk also contributes to SOUTH CAROLINA WILDLIFE magazine. In this reporting period, a key article on Oyster Reef research with accompanying Keynote editorial was coordinated with writers and editors. In addition, various Roundtable stories were submitted along with other contributions to the magazine.

In this reporting period a new news release product was initiated. A series of news features was written and disseminated to coastal newspapers. Photos and graphics were provided for each news feature package. Features go into more depth and detail than a regular story and they are useful for providing information to the public on more complex themes. Features completed to date included stories on the artificial reef program, shrimp baiting, Governor' Cup Billfishing Series and the Marine Game Fish Tagging Program. All releases in the series have met success with coastal newspapers. Our goal for the upcoming year is to develop one feature per month and average one regular release per work.

The information desk received hundreds of telephone calls from the public requesting information on a wide range of topics, including hunting and fishing information, laws and regulations, conservation and environmental inquiries, referrals, wildlife assistance and educational activities to name a few. The desk also serves as backup for the central switchboard for handling and routing calls when an immediate referral is not known to the switchboard operator.

In an effort to improve communications throughout the Division, the Coastal Information Education and Communications Office continued to produce a monthly inhouse newsletter entitled "Marine Update" which highlights ongoing program activities, progress reports, new projects, new legislation, priority issues, important meetings, budget concerns, etc. This approach to "improved communications" has been extremely popular with staff at all levels throughout the Division.

During the year, Office staff continued to coordinate the Marine Division Speakers Bureau involving programs and presentations across the state. Our greatest efforts were concentrated in the coastal area especially in response to various conservation organizations, fishing clubs, environmental groups, schools, colleges and universities. This effort has proven to be very effective in promoting the overall goals of the Division, encouraging conservation through diverse audiences and highlighting resource related issues and problems.

### **Marine Education**

During the year approximately 20,000 students, teachers and scientists from other agencies and states participated in the Division's Marine Education Program through tours, participating in an educational cruise on board an operating research vessel and through special outreach events. A total of approximately 110 educational tours and cruises were conducted for students and teachers from across the state often providing a first experience in handling live marine animals and learning about the role of the Division in the research and management of South Carolina's marine resources. Many educational outreach programs were also provided to area schools promoting environmental awareness and wise resources conservation. Staff also attended career days to discuss and promote opportunities in the field of marine science.

The Marine Education Program was involved in coordinating other outreach activities including the Department's participation in the Southeastern Wildlife Exposition, the Division's participation in the Palmetto Sportsmen's Classic, the Charleston Marine Conservation Banquet, participation in Coastweeks, Kid's Fair and other similar activities.

In addition, considerable progress was made in updating old displays and constructing new displays as part of the Ft. Johnson Public Initiative in the Marine Resources Research Institute through financial support from the Harry Hampton Memorial Wildlife Fund and the Marine Recreational Fisheries Advisory Board. A number of museum quality new displays were completed and additional displays are currently under construction.

Educational cruises were continued in the ACE Basin National Estuarine Research Reserve (NERR) as part of the overall plan for educational activities in the NERR. In addition, plans are being made to conduct an expanded "Students Teaching Students" in the NERR through funding from the US Fish and Wildlife Service.

### **Special Publications**

A number of special publications for public distribution were produced during the year. These include:

- Sea Science Series
  - South Carolina Shrimp
  - Blue Crabs
  - Oysters and Clams
  - Summer Inshore Fishing
  - Summer Offshore Fishing
- Red Drum Natural History Report
- 1995 SC Saltwater Sportfishing Tournaments Brochure
- Marine Education Program Brochure
- SC Governor's Cup Billfishing Series Brochure
- Life in the Saltmarsh Poster
- Life in the Saltmarsh Guide
- Seashells of South Carolina Poster
- MRD Briefing Manual

### **COASTAL RESERVES AND OUTREACH PROGRAM**

The Coastal Reserves and Outreach Program is responsible for coordinating and conducting division-level programs involving input from research and management units, providing field support in the outlying regions and managing representative coastal habitats through linked programs of stewardship, public education, and scientific understanding.

Regional marine biologists in Beaufort, Charleston and Georgetown counties continued to provide information and assistance to marine resource user-groups. Assessments of marine resources needs, problems and issues were made in coordination with District Nine Law Enforcement and MRD staff in each of the regions.

During this FY, biologists provided information to enable fishermen to legally and successfully participate in commercial and recreational fisheries. They responded to an estimated 1,198 inquiries concerning laws and regulations, access points, resources availability, harvesting techniques, and gear technology. Special efforts were made in liaison with law enforcement. Field support for other division projects and state-federal cooperative research was also provided.

The program continued to implement coastal reserve management plans, acquire key coastal lands and wetlands, and provide on-site management for these properties. Activities continued on Capers Island, a SC Heritage Trust property and a component of the US Man and the Biosphere Program. During the FY, approximately 1,503 persons camped on the island; the average length of stay was three days. An estimated 3,000 students, teachers, participants in nature study projects and the general public visited the island. Maintenance continued on roads and trails, docks, impoundment dikes, and headquarters facilities.

The ACE Basin National Estuarine Research Reserve continued in its third full year of funding through NOAA under the CZMA. This program is part of a national network of state owned and managed coastal protected areas to promote informed management of the nation's estuarine and coastal habitats. A field station was established on property acquired at Bennett's Point and now serves as a base of operations for reserve staff and visiting scientists and educators. The reserve is participating in a number of research and educational activities on a national scale as well as at the state and local levels. The reserve is also participating in a cooperative project with NOAA in developing a prototype PC-based product for coastal management based on interactive access to ecological characterization information. This product begins to demonstrate proof-of-

concept for the publication of spatial natural resources information, marine education concepts, bibliographic citations, and methods used to develop coastal management plans.

### PERSONNEL

This office is a satellite of the Columbia Personnel Office. The primary responsibility of this office is to insure the correct implementation of policies and procedures of the Department at the Division level and other Department components as needed.

This office has the responsibility of assisting Division staff with all personnel matters which include new employee orientation, benefits, disciplinary actions, counseling, referrals, travel arrangements, processing personnel changes, hiring, terminations, recruitment, training and promoting affirmative action.

### VESSEL OPERATIONS

Four ocean-going research vessels support research and management investigations of the Division. The R/V Palmetto is a 110' vessel that supports offshore projects. The R/V Lady Lisa is a 70' St. Augustine trawler that works in bays and sounds and near offshore areas. The R/V Carolina Pride and R/V Anita supports inshore projects.

All vessels have trawl capabilities and are able to support extended cruises. Each vessel is manned by U.S. Coast Guard licensed captains. Division vessels support various federal and state agencies with vessel needs as well as academic institutions in their education efforts.

### OFFICE OF MANAGEMENT SERVICES

Fisheries Licenses Issued During FY 1994 and 1995 w/Revenue

		<u>FY1994</u>		<u>FY 1995</u>
Trawler, Res.	540	40,500.00	544	40,800.00
Trawler, Non-Res.	269	88,255.91	275	86,359.61
Boats to 18'	856	17,120.00	904	19,335.00
Boats over 18'	188	4,700.00	211	5,789.50
Wholesale Dealer	278	14,250.00	277	14,050.00
Land & Sell	546	15,525.00	641	18,200.00
Bait Dealer	101	505.00	100	500.00
Crab Pots	338	3,380.00	387	3,870.00
Miscellaneous Pots	7	70.00	8	80.00
Channel Nets	60	15,000.00	60	15,000.00
Shad Nets	763	7,630.00	717	7,170.00
Gill Nets	549	5,490.00	567	5,670.00
Miscellaneous Nets	26	260.00	6	60.00
Seine Nets	82	820.00	53	530.00
Shellfish Dredge	19	190.00	24	240.00
Shellfish Tongs	63	630.00	68	680.00
Gigging, Res.	1878	2,041.60	1881	2,069.10
Gigging, Non- Res.	22	555.50	40	1,010.00
Trawler Capt., Res.	651	13,020.00	619	12,380.00
Trawler Capt., Non-Res.	279	17,708.00	294	18,221.25
Shellfish Forks	32	320.00	42	420.00
Shellfish Rakes	213	2,130.00	220	2,200.00

		<u>FY1994</u>		<u>FY 1995</u>
Peeler Crab	22	1,650.00	23	1,750.00
Shellfish	266	6,783.00	292	7,446.00
Other	137	1,370.00	255	2,550.00

Revenue Collected by the License Office During FY 1994 and FY 1995

	<u>FY 1994</u>	<u>FY 1995</u>
Licenses	259,904.01	266,380.46
Fines	33,766.09	26,139.05
Rent	24,238.35	24,059.33
Sale of Goods	10,360.07	21,919.45
Total	328,268.52	338,498.29
Shrimp Baiting	333,201.35	341,926.00

### **OFFICE OF FISHERIES MANAGEMENT**

The Office of Fisheries Management (OFM) is responsible for proper management of the state's living marine resources and their associated habitats while considering the economic and social benefits which these resources provide and the equitable utilization of fishery resources. This responsibility includes the regulation of fishing seasons, areas and methods, issuance of experimental, scientific and commercial fishing permits, management of public shellfish grounds and maintaining statistical records of various fisheries. The OFM is also quite active in conducting resource assessments and surveys in a broad spectrum of environmental activities related to the protection and enhancement of coastal fisheries habitat.

The OFM works closely with other units within the Division, the Coastal Environmental Enforcement District and various state and federal agencies. The Director of this office serves as the designated state official to the South Atlantic Fishery Management Council and as a Commissioner to the Atlantic States Marine Fisheries Commission. The OFM also maintains close contact with the South Carolina Legislature in making recommendations relating to fisheries laws and regulations. Various informational and advisory services related to commercial and recreational fisheries are provided to the public, including seafood market development and promotion.

The Office of Fisheries Management is made up of two large functional units composed of three (3) sections each plus staff in the OFM Administrative Office. The Management Unit is composed of the Finfish Management Section, Crustacean Management Section, and Shellfish Management section. The Management Support Unit consists of the Environmental Evaluations Section, Fisheries Statistics Section, and Economic Analysis/Seafood Marketing Section. The Fisheries Permitting and Special Projects Section is located within the OFM Administrative Office. The following is a summary of the activities and projects of the OFM during FY 1994/95.

#### **OFM ADMINISTRATIVE OFFICE**

Recreational Fisheries Conservation and Management Act of 1991. This piece of legislation was passed and signed by the Governor on May 27, 1991 and became effective on July 1, 1992. Section 50-20-90 gives the S.C. Department of Natural Resources the authority to create and design a stamp and permit and to develop marine recreational fisheries prints and related articles. The fifth S.C. Marine Recreational Fisheries Stamp Art Contest was held on July 29, 1995. The contest received entries from 20 artists. The Marine Recreational Fisheries Advisory Board met several times this year to help prioritize expenditures of the monies generated by stamp and print

sales. During 1994/95 approximately 88,000 saltwater stamps were sold to saltwater fishermen, generating over \$439,000. With the help of the Advisory Board, these monies were dispersed to a number of different recreational fisheries development, management and research projects and will help support coastal law enforcement efforts. The annual Marine Recreational Fisheries Stamp Program Report was prepared and distributed.

### **Grants Coordination**

Staff from the Administrative Office serve as liaisons between the Division and Federal Granting Programs within the U.S. Fish and Wildlife Service and National Marine Fisheries Service. It is the function of the Grants Coordinator to see that the Division meets all requirements for participation and administration of these Federal Aid Programs. In addition, this office serves as the clearinghouse for the review of new proposals and funding requests that will be submitted in the upcoming funding cycle and the review and approval of annual progress and final reports. During FY 1994/95, this office was responsible for the administration of 5 Sport Fish Restoration Grants through the U.S. Fish and Wildlife Service. This office also administered NMFS grants funded through the Interjurisdictional Fisheries Act, Cooperative Statistics Program, SEAMAP Program, Anadromous Fish Conservation Act, South Atlantic Fisheries Management Council, MARFIN, and the Atlantic Coastal Fisheries Cooperative Management Act.

### **Legislative Assistance**

During the year, OFM staff assisted legislative committees and members of the General Assembly with the development of legislation important to coastal fisheries. Proposed legislation that was prepared, reviewed, and discussed in public forum included a proposal pertaining to the Department's authority to regulate fishing in inside waters, consolidation of shad laws, use of TED's in channel nets, bycatch reduction devices in shrimp trawls, eel management, restrictions pertaining to possession of shrimp during winter, management of "live rock", shark permit requirements and bag limits, sale of gamefish and permitting of finfish mariculture activities, importation of shellfish, and illegal purchases of seafood taken unlawfully.

### **Permit Administration**

It is the function of the Fisheries Permitting and Special Projects Section within the Office of Fisheries Management to administer the Department's statutory and regulatory authority to permit effort to harvest marine resources. Existing within a wide range of laws and regulations, such authorities involve direct harvest for human consumption, resource culture, and experimental and scientific sampling.

Generally, fishery permits contain the following elements:

- 1) reference to applicable legal permitting authority;
- 2) conditions placed on harvest and seafood marketing;
- 3) specifications of fishing gear, location, and period;
- 4) reporting requirements; and
- 5) other special allowances and prohibitions.

Falling into the four general categories of harvest allowance, private management, importation, and experimental, a total of 3557 permits were issued during 1994-95 (Table 1).

For 1994-1995 joint SCWMRD/DHEC permits were issued to allow shellfish harvest from restricted waters for depuration relay and culture. Joint permits simplified permit acquisition by fishermen and allowed use of otherwise unusable resources.

Also continued was the blue crab trawl permit required since 1990, horseshoe crab trawl permits developed to assure continued health of the horseshoe crab which are held and released alive following bleeding. A reagent used in quality control of pharmaceutical production is extracted from horseshoe crab blood.

### Special Activities

Law Book Publication: The 1994 edition of "Marine Fisheries and Related laws" was published during the year. This softbound book is a reprint of those portions of the South Carolina Code of Laws specifying the Department's authorities and responsibilities related to resource management and those related to coastal and marine commercial and recreational fisheries. An updated edition is printed bi-annually, generally, with a supplement prepared as needed. The publication includes statutes and regulations of the Code of Laws of South Carolina that relate to fisheries, endangered species, aquaculture, and importation of wildlife. The booklet is available to any person acquiring a fishery license or permit, as required by law.

Redrafting Laws: A major effort to redraft laws and regulations involving coastal fisheries continued during the year as a part of the Department of Natural Resources's effort to modernize the state's wildlife and boating laws. When completed the redraft will be offered to the General Assembly.

Table 1. Fisheries Permit Issuance, FY 1993-94 and FY 1994-95

<u>CATEGORY</u>	<u>PERMIT TYPE</u>	<u>93-94</u>	<u>94-95</u>
Harvest	State Ground Permit Cards	289	313
	State Ground Permit Decals	1244	1527
	Culture/Mariculture Ground Cards*	716	666
	Culture Ground Personal Limit	191	203
	Hydraulic Escalator	46	20
	Clam Harvest - Undesignated Grounds	19	15
	Hand Gathering - Shellfish	18	8
	Hand Tongs	18	14
	Patent Tongs	5	6
	Drag Dredge	18	16
	Joint DHEC Shellfish Relay-Hydraulic	4	11
	Joint DHEC Shellfish Relay-Hand	3	0
	Riparian Shellfish	7	3
	Small Clam Possession	33	62
	Shellfish Out of Season, Possession	5	2
	Channel Nets	60	60
	Shark	-	9
	Elvers	3	-
	Whelk Trawling	135	111
	Blue Crab Trawling	142	108
	Horseshoe Crab Trawling	22	9
	Horseshoe Crab Hand Harvest	7	25
	Horseshoe Crab Possession	-	3
Private Management	Culture Permits - New	4	4
	Culture Permits - Renewals	19	5
	Culture Permits - Continuances	82	73
	Mariculture Permits - New	2	2
	Mariculture Permits - Renewals	18	4
	Mariculture Permits - Continuances	8	12
	Planting Variances	4	9
	Oyster Seed Removal	10	6

	Gamefish Collection/Possession	2	3
Importation	Sponge Crabs	2	1
Experimental/Exploratory	Commercial Experimental	1	0
	Scientific Collection	194	245
	Special Exploratory	2	2

## **CRUSTACEAN MANAGEMENT SECTION**

The Crustacean Management Section (CMS) is primarily responsible for the management of the shrimp and blue crab fisheries of South Carolina. This management includes monitoring and assessment of stocks including participation in applied research projects. Staff also make numerous educational presentations and provide general information to the public.

### **Postlarval Shrimp Survey**

Plankton samples were taken at Breach Inlet located between the Isle of Palms and Sullivan's Island. Samples have been taken at this location since 1974 to provide an early index of postlarval shrimp recruitment to the estuaries. During winter and spring 1995, postlarval brown shrimp were found in samples ranging from average to above average quantities through mid June. Warm weather in February and March resulted in above normal water temperatures during this period of postlarval recruitment. Survival of these postlarvae remained high as indicated by good catch rates in later plankton sled surveys. Plankton collections taken through late spring at Breach Inlet indicated good spawning of white roe shrimp stocks during the month of May. Some of the largest catches of white shrimp postlarvae ever observed in this project were taken in the month of June.

### **Juvenile Shrimp and Blue Crab Sampling**

Tidal creeks are sampled weekly during spring and summer for juvenile shrimp and blue crab. This work is directed towards making an early determination of the abundance and size of shrimp. This aids in prediction of commercial catch and management strategy. Size data are critical in determining growth rates which are used in predicting when shrimp will move into areas open for commercial trawling and when they will reach a harvestable size. Sampling includes trawling with a ten-ft. wide small-mesh net. Sampling in July 1994 indicated above average numbers of juvenile white shrimp in the tidal creeks near Charleston. Heavy rainfall in the autumn of 1994 flushed some small white shrimp seaward in areas of the coast. Creek sampling for juvenile brown shrimp in May and June 1995 produced some very large numbers of juvenile brown shrimp, in addition to good numbers of small white shrimp (several thousand/tow). Catch rates of blue crab appeared to be about average in number.

### **Subadult and Adult Shrimp and Blue Crab Sampling**

The R/V Carolina Pride is used to monitor shrimp and blue crab on a routine basis in the State's coastal waters. By trawling in the larger creeks, rivers and open waters, data are collected which provide information on shrimp as they begin migrating toward the ocean. This sampling is supplemented by trawling with outboard motorboats in the central and northern coastal zones of the State. Sampling data are important in determining the commercial shrimping season's opening and closing dates for the areas from the beaches to three miles offshore. The commercial trawling season closed on 27 January 1995. In late April and early May, ovarian condition and sex ratios of white shrimp were monitored by trawling in Charleston Harbor and off Morris Island and by accompanying commercial trawlers for sampling in nearshore areas off Charleston, Rockville, and Beaufort. Catches of white roe shrimp were above average during much of this sampling. Ovarian development of female white shrimp indicated that many had apparently spawned, or were near spawning condition by early May. The area lying between Federal waters and the "3 mile line" was opened to trawling on 4 May, 1995. The remaining offshore trawling areas were opened on 16 May. Brown shrimp catches were somewhat above average in research trawls in 1995, and were taken earlier than normal in commercial landings,



but were of a relatively small size. Numbers of blue crab captured by research trawls appear slightly below average for 1994-95, while the commercial fishery appears to be undergoing some increased effort, as prices to fishermen are still good at this time.

The Channel Net season opened on 28 September 1994 and closed on 22 November. The channel netters landed smaller-than-average sized shrimp in 1994, in average quantities. The shrimp baiting season opened on 9 September 1994 and closed on 8 November. This season was hampered by inclement weather and heavy rainfall in some areas; overall catch was below average (1 million+ lb. of tails).

### **Blue Crab Potting Surveys**

A fishery-independent survey of blue crab stocks has been conducted by staff since 1988 in which crab traps are fished in a standardized manner in each of the State's major estuaries. The goal of this project is to determine stock trends and whether trawling studies are accurately sampling the blue crab population. Catch rates through the first seven years of the survey have suggested relatively stable stocks of blue crab. Catch rates in 1994 were less than average, perhaps a reflection of increased competition from commercial potting in some areas.

### **Bycatch Reduction**

A program to assess bycatch reduction devices in shrimp trawls was conducted prior to and during the 1995 shrimp season by comparing catches on commercial trawlers. Some apparent reduction of finfish was noted, with little loss of shrimp. This work was conducted via a grant under the Atlantic Coastal Fisheries Cooperative Management Act.

### **Educational Displays**

During the year, staff participated in numerous public education demonstrations including a local seafood festival and a "blessing of the fleet". Staff provided several seminars for commercial fishermen and the general public.

## **FINFISH MANAGEMENT SECTION**

The Finfish Management Section (FMS) is concerned with the management and development of South Carolina's marine finfish resources. During the past fiscal year this program carried out a number of State funded projects as well as Federally funded projects which are described below.

Several articles for Division publications were prepared and the 1995 saltwater fishing tournaments and state record fish brochure was published and distributed throughout the state. An updated reef map and LORAN numbers listing was made available to the public in early 1995 and several hundred copies were distributed. Information concerning South Carolina's marine fisheries was also provided and utilized in articles appearing in several regional and national publications such as: Saltwater Sportsman, Southern Saltwater, Sport Fishing, Tournament Digest, Marlin, Carolina Outdoors and Outdoor Life. Hundreds of phone and mail requests for general fishing information and current fishing conditions were also responded to.

FMS personnel continued to serve on several committees and sub-committees of regional and national fisheries management bodies such as the South Atlantic and Gulf Coast Fisheries Management Councils and the Atlantic States Marine Fisheries Commission. Assistance was also provided to several local and State Agencies such as: South Carolina Coastal Council with the Charleston Harbor Project; Charleston County PRT with the building of the Folly Beach Ocean fishing pier; and City of Charleston with a children's Fishing Tournament in Colonial Lake and the 28th Annual Trident Fishing Tournament.

FMS staff prepared eight research or project proposals and attended several local, regional, and national professional meetings including conferences concerning artificial reefs, American shad, yellowfin tuna, red drum and golden crabs. Personnel visited meetings of each of South Carolina's major saltwater sportfishing clubs as well as several conservation associations.

FMS personnel gave 31 talks to sportfishing clubs, civic clubs or other groups, and provided

information utilized in seven Division press releases concerning fisheries management. Direct interviews to television and radio stations were also given. Outdoor writers and photographers were assisted in obtaining photographs and information for articles on marine recreational fisheries opportunities in South Carolina. Personnel provided information used to develop and implement the saltwater portion of the 1 800 ASK - Fish telephone information system for South Carolina.

FMS personnel assisted with several Division and Department special activities and projects such as: the Palmetto Classic, Southeastern Wildlife Expo, the Forth Annual Harry Hampton Memorial Wildlife Banquet and Auction, and the Charleston City Childrens' Fishing Tournament.

The following describes the primary activities and accomplishments of the various projects of the FMP:

### **STOCK ASSESSMENT UNIT**

#### **American Shad Project**

The American shad supports the single most important commercial finfish fishery within state waters. The recreational fishery for this species is increasing in importance and there is potential for further growth in this fishery, particularly in the Santee River as a result of the Santee-Cooper Rediversion Project. There are indications that the shad population in the Santee system is in a state of growth that is likely a direct result of rediversion. Shad stocks in most of South Carolina's rivers appear to be stable. In contrast, shad stocks, and the recreational and commercial fisheries they support, in the Edisto and Combahee Rivers are apparently at very depressed levels relative to historical levels.

The major activity in the NMFS-funded Anadromous Project during the 1994-1995 fiscal year has been the completion of a tagging study on American shad in the Edisto River. This study was initiated to determine the fishing mortality rate (FMR) on pre-spawning shad in the Edisto, where shad stocks are perceived to be in a state of decline. In-stream FMR's are needed to determine the condition of riverine shad stocks so appropriate management strategies can be implemented.

Results from the 1995 tagging study, in conjunction with those from a similar study in 1994, and commercial catch and effort records, indicate that the Edisto shad population remains in poor condition and is in need of more intensive management. These results showed a decrease in the FMR for females of nearly 50% as compared to the FMR produced from 1989 and 1990 tagging studies. A reduction in fishing effort has apparently reduced the FMR to a level that should allow for a gradual improvement in stock status. However, the 1994 tagging study did not produce catches high enough to produce reliable estimates of the current FMR as needed to intensively manage this resource. Shad tagging during the 1995 season was much more productive with over 200 female shad tagged. However, the 1995 season was characterized by very high river flows that may have greatly reduced effort and catches compared to a more typical season relative to hydrological or meteorological conditions. Accordingly, a similar tagging study has been proposed utilizing NMFS funding for the 1996 shad season.

#### **Large Coastal Shark Investigation Project**

A proposal to conduct a second year of fishery independent monitoring of large coastal shark populations off South Carolina was funded by the NMFS Interjurisdictional Fisheries Program. Quarterly research cruises were conducted to compare current longline catch rates and species composition with results from a previous shark assessment done in 1983-84. Sampling was done with cable longline gear to allow comparisons with the earlier survey. Substantial changes were noted during both recent sampling years, in the species composition, size composition and catch per unit effort (CPUE), compared to 1983-84 data.

#### **Red Drum Project**

This project, funded by Marine Recreational Fisheries Stamp Program revenues, is directed at evaluating methods of sampling adult red drum in the coastal waters of South Carolina and

developing information on the characteristics of these populations. Because of concerns about adverse impacts on critical spawning stock, none of the captured red drum were sacrificed for age determination. Fish were measured, tagged and released. Fin clip samples were taken from most fish, for potential DNA stock identification studies of the offshore population. Continued sampling of these populations should provide information on adult growth, stock identification and migratory behavior. Information on adult stocks has been cited as a critical information need in the ASMFC and SAFMC management plans for this species.

During the fall of 1994, sampling with bottom longline gear on near-shore, live-bottom areas, resulted in the capture of 186 adult red drum. All captured red drum survived and were tagged and released. This work will be continued during fall of 1995. The project has so far demonstrated that adult red drum can be effectively sampled in the ocean and that schools of these fish have a strong affinity for live-bottom areas during their fall, post-spawning offshore migrations. With continued sampling, increasing the size of the tagged offshore population should provide information on adult growth rates and answer the question of whether the adult populations form localized spawning units or if these populations are more migratory.

#### **Small Coastal Shark Project**

A proposal to conduct studies on small coastal species of sharks was prepared and submitted for funding under the Interjurisdictional Fisheries Program. This project will use bottom longline gear to collect information on the species, size and sex composition and relative abundance of small coastal shark species in South Carolina waters and parallel information on juvenile, large coastal shark species. The need for this type of data has been noted in the NMFS Secretarial Shark Fishery Management Plan. This work is expected to be initiated in August 1995.

### **STOCK UTILIZATION UNIT**

#### **Marine Game Fish Tagging Project**

Over 6700 fish were tagged by 945 participating anglers. Over 8400 anglers have participated since the inception of the program in 1974. During the fiscal year, anglers tagged 57 target species and 17 non-target species. Non-target species made up only 0.9% of the total fish tagged. Charter and headboat captains tagged nearly 25 percent of the total fish tagged.

As in the past, red drum continued to dominate but comprised only 40 percent of all the fish tagged instead of 50 percent as in previous years. Anglers have complied with the changes in the program. The average size of red drum tagged within the program increased to 28.2 inches from 19 inches in FY 93/94. As requested, most anglers are no longer tagging spotted seatrout unless they are over 18 inches. This has resulted in fewer fish being tagged overall. Billfish and sharks continued to dominate the offshore species being tagged but more anglers are tagging dolphin and wahoo than previously.

During the year, 438 anglers reported the recapture of 665 tagged fish. The recapture rate of red drum was 14.6% and for the second consecutive year, 73.9% of the striped bass tagged during the fiscal year were recaptured. Most of the striped bass recaptures occurred in two popular fishing areas that undergo heavy fishing pressure.

Many tagged fish were recovered after traveling long distances. A white marlin was recaptured off Venezuela and a barracuda was recaptured at Man-O-War Cay in the Abacos. Several others (cobia, amberjack, flounder, and sheepshead) were recovered off Georgia and Florida.

Public support continued to be strong with many individuals donating their time and/or money to the program. For the third year, primary funding for the project was received from Marine Recreational Fisheries Stamp Program revenues.

Tag and release data were provided to several groups or individuals at their request: gag data to MARMAP, striped bass data to David Allen (G&FWF Division), amberjack data to NMFS- Miami, and recapture data to the Artificial Reef Program.

A technical report summarizing the results of the tagging program from 1974 through 1992 was

printed and distributed to anglers making requests. Florida Sea Grant, per our recommendation, is using replicas of our tagging applicator as a tool for venting reef fish before releasing.

#### **Master Angler Project**

This program was initiated in 1987 to provide recognition to anglers who catch trophy fish and to those anglers who practice conservation through the tag and release of game fish. During 1994-95, forty-three anglers qualified for certificates in the citation fish division. Conservation certificates were awarded to thirty-seven fishermen who tagged and released at least thirty fish. Starting in 1990 all fish tagged and released for the Marine Game Fish Tagging Program were automatically entered in the Master Angler Program. All weigh stations were supplied with the new brochures, entry cards and posters.

#### **State Record Project**

Records are currently maintained on sixty-nine species of marine sportfish available to South Carolina anglers. Personnel investigated 4 record applications. One was rejected due to misidentification. The following applications were accepted for South Carolina State Record status:

<u>FISH</u>	<u>WEIGHT</u>	<u>PORT</u>	<u>DATE</u>	<u>ANGLER</u>
Crevalle Jack	8-03	Fripp Inlet	4/95	L. Hudson
African Pompano	27-12	Charleston	6/95	M. Davis
Blackfin Tuna	33-03	Charleston	5/95	I. Psaras

Because of the prestige and economic incentives now being placed on establishing state records, a formal policy was adopted in FY 93-94 by the DNR Board for the establishment and recognition of state record marine gamefish. By adopting an official operations policy, it is the intent of the Department that each record application be processed uniformly. Standardization of the investigative procedures will insure the fair and equitable treatment of all applications. It will also serve to guarantee that all reasonable steps are taken to acquire accurate and complete data pertaining to each potential record. As a result, all information necessary for the accurate determination of each applicants qualifications will be documented.

#### **Sportfishing Tournament Project**

Saltwater sportfishing tournaments were held throughout coastal South Carolina during this fiscal year. The 65 competitions that were held ranged in size from the Fishing for Miracles King Mackerel Tournament with over 250 boats, to club tournaments with as few as 10 boats participating. This represents a 19 percent decrease from the number of competitions held last fiscal year.

Section personnel continued working closely with tournament organizers in planning and scheduling their events. The guide to developing successful tournaments published last fiscal year continues to be popular not only with in-state tournament directors but out-of-state as well. Through the efforts of this program, most major tournaments have adopted minimum qualifying lengths for entries into their events to reduce the kill. Many events even offer an additional award for the tag and release of fish, further reducing the kill of fish while assisting scientific studies.

Additional assistance was provided to 18 tournaments through the weigh scales assistance program. Under this program state certified weighing scales are made available to tournaments at no cost. These scales provide the ability to accurately weigh fish from just a few ounces to over 2,000 pounds. This is done to alleviate many of the problems competitions encounter through use of inferior weighing scales.

The billfish monitoring and catch per unit of effort D-J project was expanded to include primary coastal pelagic gamefish of special management concern. The catch per unit of effort survey was

carried out at fourteen sportfishing tournaments during FY 94-95. Data on fishing effort, catch composition, total harvest and size of fish were recorded on 1,269 competitive fishing trips to provide information on the conditions of coastal and oceanic pelagic gamefish stocks.

### **South Carolina Governor's Cup Billfishing Series Project**

Former Governor Carroll Campbell's interest in billfishing and conservation inspired the development of this program in the fall of 1988. It is designed to promote the billfishing industry while providing incentives for increased conservation of the resources. The goals of the program are to promote coastal tourism through the promotion of billfishing; to provide incentives to tournaments and sport fishermen to adopt stronger conservation practices; and to raise funds to help pay for needed marine fisheries conservation work.

Governor David M. Beasley Insured the future continuance of the program by signing Executive Order 95 - 17. This officially created the Governor's Cup and assigned the program's operation to the Department of Natural Resources. A fourteen member Board of Directors was appointed by the DNR Board with the approval of Governor Beasley to advise on the operation of the series. Mr. Thomas Byrd of Charleston was elected chairman. Donald L. Hammond with the Office of Fisheries Management of the Division of Marine Resources was named program director overseeing its operation. A 12 member Tournament Committee appointed by the Governor's Cup Board carries out the Series which was comprised of six tournaments in 1995.

Through an agreement with the North Carolina Governor's Cup Billfish Conservation Program, the top five boats in their series would compete against the top five boats of the South Carolina program in an annual interstate tournament to determine which state has the best billfish anglers. The goal is to stimulate additional promotion of sportfishing in both states while focusing more attention on the need to conserve our valuable gamefish resources. The third annual Carolinas Shootout was held September 1, 2 and 3, 1994 at Pirates Cove Marina in Manteo, N. C. Next year's competition will be hosted in South Carolina September 14, 15 and 16 at Wild Dunes Yatch Harbor on the Isle of Palms.

The 1995 program was comprised of the six major billfish tournaments held May through July. Anglers fishing these competitions amass points for their largest billfish landed in each event and for those tagged and released with the emphasis placed on the latter. These boats and anglers compete for three top awards: Outstanding Billfish, Outstanding Billfishing Boat and Outstanding Billfish Conservationist. Winners of these awards have their name engraved on a perpetual trophy. Additional awards are presented for outstanding female angler, outstanding youth angler, largest dolphin, largest tuna and largest wahoo.

Considering the economic and adverse weather conditions, results of the seventh year were good. A total of 108 different sportfishing boats from as far away as Ponce Inlet, Florida and Wilmington, Delaware participated in the Series. Weather was generally favorable for the 1995 spring fishery with only one fishing day canceled. The concept of conserving our billfish resources through the tag and release of fish carried over into everyday fishing with 88 percent of the billfish caught in FY 1994-95 being released. Private funds and grants financed the program. The 1995 series raised an additional \$8,800 for special marine fisheries conservation work.

### **Billfish Survey Project**

The number of billfish (blue marlin, white marlin and sailfish) reported landed and released rose slightly from FY 1993-94. A total of 250 billfish were reported caught in FY 1994-95. Sport fishermen's concern over the declining status of the billfish stocks world wide manifested itself in the continued high proportion of billfish being released. In FY 1994-95, 88% of the billfish reported caught were returned to the water alive. A total of 184 billfish were tagged by sport fishermen last year off the South Carolina coast. Many South Carolina anglers feel that the fishing has improved because of the non-consumptive fishing currently being practiced.

The 1994-95 season saw continued high numbers of sailfish (139 individuals) landed, roughly 72 percent higher than in most previous years. An above average number of blue marlin (91) were reported. No swordfish or longbill spearfish were taken in the sportfishery during this fiscal year. An official State certificate documenting each billfish catch is offered anglers catching these fish as an incentive to report their fish. Over 240 certificates were mailed out this fiscal year.

During this fiscal year personnel conducted intensive surveys on ten billfish and four king mackerel tournaments. Personnel collected catch per unit of effort data along with complete biological data on all billfish brought to the dock. A new sampling method was initiated for sampling of king mackerel tournaments utilizing angler generated data in an effort to account for the portion of the anglers that do not return to the weigh station. Portions of this data were provided to the National Marine Fisheries Service in cooperation with their Oceanic Game Fish Investigations and king mackerel programs.

## **STOCK AND HABITAT ENHANCEMENT UNIT**

### **Marine Artificial Reef Program**

During FY 1994 - 95, all privately maintained aids to navigation in place on artificial reefs and wreck sites were inspected. Six new buoys were deployed on new and existing reef construction sites. Four older buoys recovered at sea were reconditioned and deployed on reef sites as well.

During 15 separate field trips along the coast, thirty days were spent conducting monitoring activities on the state's marine artificial reefs. Close inspections of reefs were conducted to monitor physical stability and structural integrity of individual materials as well as to assess their biological effectiveness. Samples were taken of both sessile and motile organisms on several reefs constructed from ex-military vessels to test for the potential bio-accumulation of heavy metals and PCB's from these vessels. Data were also collected in support of a thesis project for a College of Charleston graduate student examining the effects of variations in reef material design on resident fish populations.

Monitoring was conducted through the use of diver observations as well as side scan and hull-mounted sonar assessments of reef materials. Side scan sonar and hull mounted sonar were utilized on all newly constructed reefs to establish the precise location as well as relative lay-out of all materials deployed on the sites. Side scan surveys were essential in locating several individual reef structures which were deployed several hundred yards from their intended sites by a marine contractor.

During FY 1994 - 95, ninety SCUBA dives were conducted, in which project personnel closely examined numerous reef structures on reef construction sites ranging from depths of 30 to 110 feet of water. Twenty-one stationary fish counts were conducted on seven selected reefs along the coast where visibility and sea conditions permitted. Video and still photographic records were also obtained when possible.

During FY 1994 - 95, twelve separate artificial reef construction projects were completed in South Carolina's coastal and offshore waters on seven permitted reef sites. Site selection surveys were completed on five new reef construction sites, and permits were obtained on three.

The following is a summary of marine artificial reef construction activities completed during FY 1994 - 95:

<u>Reef</u>	<u>Materials Added</u>	<u>Date</u>
Parris Island	2 barge-loads concrete	6-7 Jul 94
Parris Island	2 barge-loads concrete	17-18 Jul 94
N. Edisto Nearshore	110 ft steel barge	16 Sep 94
Charleston 60 Foot	20 barrel/FAD units	18 Oct 94
Charleston 60 Foot	32 missile steel tubes	21 Oct 94



Georgetown 60 Foot	140 foot steel barge	28 Dec 94
" " "	12 steel pipe/tire units	28 Dec 94
Capers	150 shopping carts	21 Apr 95
N. Edisto Nearshore	130 foot steel barge	26 Apr 95
Charleston 60 Foot	135 concrete reef balls	26 May 95
" " "	12 ex-Navy steel donuts	26 May 95
Ten Mile	130 foot steel barge	30 Jun 95
" " "	6 steel cement drums	30 Jun 95
" " "	One ex-Navy A-7E aircraft	30 Jun 95

At the end of FY 1994 - 95, nine additional artificial reef construction projects remained in progress. Most of these projects should be completed by mid-FY 96. Past work in the testing and development of concrete reef units has resulted in the continued use of these materials. One thousand of these structures will be deployed on 5 reef sites during early to mid-FY 96.

#### **SHELLFISH MANAGEMENT SECTION**

The Shellfish Management Section (SMS) develops, implements, and supervises initiatives necessary for the effective management of the State's shellfish resources. Within the section's area of responsibility, the following activities were conducted during FY 1994-95:

##### **Shellfish Season**

The season for harvesting oysters and clams, as authorized in the S. C. Code of Laws, Section 50-17-365, opens annually on September 16th and closes on May 14th unless biological or other conditions warrant other times to open or close. This season, due to elevated water temperatures and market conditions, clam harvesting was authorized to begin on September 1, and oyster season was delayed until October 1, 1994. Oyster season closed on May 14th and clam season closed on May 31, 1995.

##### **Shellfish Field Management**

In response to legislative changes that were implemented in 1986, shellfish acreage available for public use has nearly doubled. Currently there are 54 State shellfish grounds consisting of approximately 3,200 acres. Annual assessments of State grounds are conducted during the closed shellfish season (May through September) to determine which grounds, based on an assessment of the resource, are suitable for commercial and recreational harvesting during the forthcoming season.

The most effective management strategy for preventing over harvesting on State shellfish grounds has been to control the harvesting effort through a commercial permit system and require reporting of harvests from commercial shellfishermen by geographic area. SMS personnel are involved in management duties concerning shellfish harvesting permits, cultivation requirements, mariculture permits, State shellfish grounds, public oyster grounds, whelk, scallop, clam and oyster resource assessments, mechanical harvesting permits and providing support to other DNR programs.

A statewide intertidal oyster survey initiated in 1980 is periodically updated in heavily harvested locations. Survey information continues to be furnished to the S.C. Department of Health and Environmental Control and various commercial interests. In cooperation with the DNR's Environmental Evaluations Program, special intertidal shellfish surveys are conducted upon request in estuarine areas where docks, bulkheads and other encroaching structures are proposed for construction.

##### **Shellfish Culture Permits**

Ninety-five commercial shellfish culture permits, totaling 1,804 acres are currently under cultivation. A total of 55,285 bushels of oysters and 2,842,500 clams were harvested during FY

94/95 from culture permits. Shellfish survey maps, maintained by the SMS (1:12,000 scale) are provided to shellfish culture permit holders and permit applicants. In addition, these maps are available upon request to the South Carolina Department of Health and Environmental Control, the U. S. Army Corps of Engineers, as well as to private entities.

A series of shellfish maps have been developed from National Oceanographic Survey (1:80,000 scale) charts indicating locations and boundaries of the five management classifications of South Carolina shellfish bottoms: 1) shellfish culture permit grounds; 2) State shellfish grounds; 3) public oyster grounds, 4) water quality classifications, and 5) grant areas. Boundary information is updated as changes occur.

#### **Shellfish Culture Permit Planting and Assessment**

All shellfish culture permit holders are legally required to plant 125 U. S. bushels of seed oysters, shell, or other approved cultch material per acre under cultivation each calendar year. During this reporting period, one technician and two biologists monitored planting activities. Effective scheduling and communication has resulted in verification of all seed and cultch material planted in 1994. Recorded planting on commercial shellfish culture permits in 1994 was 63,254 U. S. bushels of seed oysters, 34,312 bushels of shell, 7,779 bushels of approved cultch material, 80 bushels of seed clams and 115,456 bushels in situ cultivation for a total of 220,880 bushels.

From January 1, through June 30, 1995, 19,512 bushels of seed oysters and 52,351 bushels in situ cultivation have been planted, totaling 71,864 bushels. All shellfish culture permits not planted with the assessed quota must, by law, be canceled or reduced in acreage by the Department. This requirement mandates that many hours be expended each year in on-site monitoring and proper verification.

#### **Mariculture Permitting and Management**

Harvesting is allowed on shellfish mariculture permits throughout the year. During 1994/95, the SMS processed two applications for clam mariculture permits. Eighteen clam mariculture permits totaling 756.9 acres are currently under cultivation, including Atlantic Littleneck Clam Farms in Charleston and

Beaufort counties, the largest commercial clam farming facility in the world. One oyster mariculture permit of 15.8 acres is in operation.

#### **Commercial Whelk Fishery**

South Carolina's offshore whelk fishery began in 1978 as several commercial shrimp fishermen diversified in an effort to compensate for poor shrimp harvests. Using gear similar to shrimp fishing, harvesting knobbed and channeled whelks evolved as an alternative fishery. Production peaked in 1982 at over 32,000 U. S. bushels.

One hundred and eleven permits were issued to trawlers for the February 10 - April 26, 1995 whelk season. Total production was 31,168, U. S. bushels, the second highest recorded with an ex-vessel value of approximately \$249,344. Returns from an earlier 10,000 whelk mark and recapture study indicate that offshore whelk populations are slow growing and propagate in confined oceanographic areas.

#### **Assessment of Dock Permits**

Expanding shoreline development and population growth in recent years have resulted in significant increases in the size and number of private docks, piers and other pile supported structures in South Carolina's coastal zone. These structures can encroach upon valuable molluscan shellfish resources in a number of ways, including: the restriction of public access and use; interference with shellfish management and cultivation operations; and physical and environmental damage to shellfish resources.

Although not considered a major problem in the past, the continued proliferation of these structures in areas supporting shellfish resources has become a significant concern. The SMS



has worked closely with the town of Kiawah Island and its developer, Kiawah Resorts Associates to identify shellfish resources in areas that would be impacted by dock construction.

### **Recreational Shellfish**

Recreational shellfish management activities involve the marking of Public Oyster Grounds and State Shellfish Grounds with signs designating recreational harvesting areas. Signs are inspected annually and replaced as required. Other activities include answering shellfish inquiries, supplying recreational harvesting maps and other consumer information.

Relay of seed oysters from overgrown areas to public oyster grounds, utilizing the R/V Oyster Catcher II was allowed to proceed after a U.S. Army Corps of Engineers permit requirement was rescinded. This allowed relay operations for approximately six months. During the period from December through June, a total of 10,074 U.S. bushels of seed oysters were relayed and planted on the Folly River POG, Green Creek POG, Hamlin Creek POG, and Last End Point POG.

As a result of a comprehensive assessment of the State's sixteen public oyster grounds, and subsequent review and input from Division staff, recommendations outlining proposed modifications to the boundaries of ten of the sixteen POGs were prepared for presentation to the appropriate county legislative delegations. If approved and acted upon, these changes will offer improved recreational shellfish harvesting opportunities for the public. Proposed boundary changes are based on presence of docks, abundance of existing shellfish resources, proximity to boat ramps and the potential for enhancement through cultivation and planting.

### **Shellfish Management Program Geographic Information System and Data Management**

Shellfish harvesting data from each State shellfish ground, culture permit and mariculture permit is captured monthly and displayed graphically on SMS computers in order to provide contemporary information for management purposes. Seasonal data is consolidated to illustrate harvesting trends over a five year period. Graphic illustrations of harvesting pressure along with in situ resource assessments, greatly enhances the management of State shellfish grounds.

Several Geographic Information System (GIS) intertidal oyster survey maps have been produced and will be used for future shellfish resource management and environmental decisions. Cartographic data are now available in both soft and hard copy formats. These color GIS maps are sensitive to the

changing dynamics of the coastal environment and allow more responsive management in areas temporarily closed by poor water quality.

#### **SMS Recreational Maps on the DNR's World Wide Web Home Page**

In an effort to provide wider dissemination of recreational harvesting areas throughout the State, 54 maps of State shellfish grounds and 16 Public oyster grounds were digitally scanned and incorporated into the DNR's home page on the world wide web (<http://water.dnr.state.sc.us/www/dnr/dnr.html>). Recreational license requirements, shellfish seasons, catch limits and gear restrictions are included along with the maps which may be viewed on line or downloaded.

#### **Draft Policy on Importation of Molluscan Shellfish**

The SCDNR Board adopted the Marine Resources Division's policy and guidelines to regulate the importation of molluscan shellfish. These guidelines were promulgated over concern from the possible introduction of diseased shellfish which can transmit pathogens to wild or cultured stocks of South Carolina shellfish along with the possible proliferation of undesirable marine organisms (both indigenous and non-indigenous). The newly developed procedures will reduce the associated risks while at the same time fostering the development of a mariculture industry and allow for the importation of shellfish for market purposes. State legislation to establish the permitting system envisioned in the policy is currently being pursued.

### **FISHERIES STATISTICS SECTION**

The Fisheries Statistics Section (FSS) consists of Data Collection and Data Management Units. During this FY, the Data Collection Unit included the Assistant Section Supervisor, two Port

Agents, the recreational finfish survey Field Chief, and three Creel Clerks. The Data Management Unit consisted of the Data Manager (Section Supervisor), Data Coordinator, and the Administrative Support Specialist. The Section Supervisor and Assistant Section Supervisor were supported by state appropriations. The Data Manager, Data Coordinator (temporary grant), and two Port Agents (one temporary grant) were funded by the Cooperative Statistics Agreement with the National Marine Fisheries Service (NMFS). The recreational fisheries survey Field Chief, two Creel Clerks (temporary grant), and the Administrative Support Specialist (temporary grant) were funded by the Sport Fish Restoration Act (Wallop-Breaux) program. One Creel Clerk was funded under special contract with KCA Research, Inc.

The Data Collection Unit obtained commercial fisheries catch and effort data from mandatory monthly reports submitted by approximately 180 active wholesale dealers and shellfish dealers, voluntary weekly shrimp reports from about two dozen major operators, voluntary fish trip tickets supplied by 11 dealers, and landings reports required from participants in several special permit fisheries (channel net, whelk trawl, shellfish escalator, and horseshoe crab). Species composition and size distribution data for shrimp were collected during routine visits to major docks during the season. From July 1994 through June 1995, landings from 95 offshore fishing trips were sampled for length distribution, including those from 54 snapper reel, 19 wreckfish, 9 bottom longline, 9 trap, and 4 troll trips. A total of 8,651 fish of priority species was measured. Market and employment information was obtained from 231 wholesale dealers.

Recreational finfish catch and effort data were collected as part of the regional Marine Recreational Fisheries Statistics Survey (MRFSS) under NMFS oversight and a state finfish survey (SFS). During the 1994/1995 performance period, 1,891 MRFSS interviews were acquired (731 in the shore mode, 287 in the charter boat mode, and 873 from private boat anglers). A total of 673 SFS interviews was also obtained. Trip reports were submitted by 25 headboats and 193 charter boats. A mail-out survey to assess the shrimp baiting fishery was completed, with a return rate of 41% (1,418 of 3,456 survey forms returned).

Commercial fisheries field data were coded, key entered, edited, and transmitted to regional NMFS files by the Data Management Unit. All contracted submission deadlines were met during the performance period. This group monitored compliance by obligated information providers, issuing delinquent reporting letters and affidavits for appropriate action. Staff attended court cases when necessary.

During the period, data management programming was updated to run on the Marine Resources Division's UNIX mainframe computer. A new PC-based compliance tracking system was implemented to assist staff monitor mandatory reporting requirements. Both commercial and recreational data were compiled and distributed to staff, academia, the media, and other state agencies.

MRFSS interview forms were edited by the Creel Clerks and sent on a regular schedule to the NMFS subcontractor for additional processing. All quotas for the performance period were satisfactorily met. SFS data were key entered and edited for locally maintained files. Charter boat trip data was coded, key entered, and edited with monthly printouts generated. Constituency liaison was undertaken in several ways. Port Agents distributed materials to the commercial sector during dockside visits and served as a conduit for information flow between the MRD, the NMFS, the South Atlantic Fishery Management Council, and the fishermen. Creel Clerks performed a similar function with recreational anglers by dispensing copies of updated sportfishing regulations and fish identification materials. Program staff provided editorial and graphics support for various MRD publications, participated in MRD educational activities such as the harbor cruises, and served on several internal coordination committees. The Data Manager served as the MRD's representative to and Chairman of the South Atlantic Statistics Committee and was the MRD's representative on the Southeast Cooperative Statistics Committee. The

recreational fisheries survey's Field Chief represented the MRD at the regional MRFSS wave review meetings.

### **ENVIRONMENTAL EVALUATIONS SECTION**

The primary function of the Environmental Evaluations Section (EES) is to investigate, monitor and report on changes and alterations from both natural processes and human activity within South Carolina's coastal and marine environment. Permit applications and requests for comments to federal and state regulatory agencies which involve biological, physical and chemical alterations to marine, estuarine, and freshwater wetland and aquatic habitats are continually reviewed by EES biologists. These agencies include the U.S. Army Corps of Engineers (USACOE), the U.S. Coast Guard (USCG), and the S.C. Department of Health and Environmental Control including the Office of Ocean and Coastal Resource Management (formerly the S.C. Coastal Council, SCCC) (SCDHEC/OCRM). Comments from these reviews are drafted by EES staff and, after appropriate Division internal review, are forwarded through the DNR Coastal Environmental Coordinator to the DNR Director for Environmental Programs for inclusion into a single Department response for each application and certification request.

Other activities of the EES include the preparation of resource inventories and assessments; the review of federal and state environmental impact statements (EIS's) and environmental assessments (EA's), and reports required of more complex proposed alterations; investigations of spills and discharges of toxic materials and contaminants, fish kills and other impacts related to maintenance of high water quality; participation in Natural Resource Trustee issues on contaminated sites; assistance in field sampling efforts for ongoing studies of the Environmental Studies Section of MRRI, as well as other agencies; and participation on numerous committees and task forces related to environmental impacts.

During FY 1994-95, the EES reviewed and commented on a total of 1,431 SCDHEC/OCRM, USACOE, and USCG permit applications and certifications for various construction activities and alterations in coastal wetlands and estuarine and marine waters of South Carolina. The table below presents a comparison of the total numbers of permits reviewed over a 10 year period since 1985.

#### **Annual Comparisons of Permit Applications**

Reviewed During Fiscal Year FY 1985 through FY 1994-95.

<u>Fiscal Year</u>	<u>No. Processed</u>
1983-84	594
1984-85	666
1985-86	682
1986-87	900
1987-88	842
1988-89	934
1989-90	759
1990-91	949
1991-92	883
1992-93	872
1993-94	1007
1994-95	1431

Additionally, 189 responses to other requests by many of the same state and federal environmental quality agencies for programs (SCDHEC NPDES permit applications, state clearinghouse reviews, etc.) were also processed. These additional requirements brought the total of EES reviews and reports to 1,620 for this year. The steady increase in the numbers of applications for docks and piers, boat ramps, and shoreline stabilization structures bears out the

continued demand for water oriented development and the ensuing impacts to the various components of the estuarine ecosystem in coastal South Carolina. Additionally, as development continues to increase and spread throughout the coastal plain of South Carolina, so does the number of permit applications for alterations to freshwater wetlands. The influx of new residents and visitors into the coastal region continues to put pressure on our transportation systems and utilities, as evidenced by numerous permit requests for wetland alterations resulting from upgrading and expansion of existing and construction of new infrastructure such as highways and wastewater treatment facilities.

During FY 1994-95, EES continued a more detailed level of review of applications for docks and other structures in open shellfish waters. Permit applications are carefully screened to ascertain any adverse impacts on productive shellfish grounds and to determine if access to these resources for recreational and commercial uses will be affected. EES staff works closely with Shellfish Management Section staff in these review efforts. In an effort to gain a better understanding of the level of dock encroachment in remaining shellfish grounds and to provide data necessary to plan for the long-term protection and management of shellfish resources, a cooperative effort continues between the MRD and SCDHEC/OCRM to digitize the location of all issued dock permits in the coastal region. This data will be entered into the MRD geographic information system (GIS) for analysis toward planning for balanced resource allocation.

The documented increases in coastal development and the ensuing impacts to coastal resources continue to be a cause of significant concern. Fisheries resources and associated habitat are under increasing pressures from numerous impacts related to human encroachment. These resources are very susceptible to degraded water quality and the chronic perturbations resulting from non-point source pollution, wastewater discharges and dredge and fill in wetlands. The EES personnel continue to interact with other programs at the MRD in developing and pursuing investigations into the apparent effects of these activities on fisheries resources.

EES personnel participated in numerous activities related to oil and hazardous material spill planning and response during FY 1994-95. These activities included active participation on the Area Response Committees (ARC's) established by the U.S. Coast Guard pursuant to the Oil Pollution Act of 1990 (OPA 90) for both Charleston and Savannah, participation on the Liquid Spillage Control Committee for Charleston Harbor, participation in several intensive oil spill response drills for all response personnel, and other miscellaneous activities. Additionally, EES personnel received notification of and responded to several minor spill events, none of which resulted in natural resource injury sufficient to warrant damage assessment.

During FY 1994-95, the interagency Coastal Pesticide Advisory Committee (CPAC), chaired by EES Assistant Section Supervisor, continued to function successfully, meeting bi-monthly and working toward the common goal of protecting coastal resources and wise pest management in South Carolina's coastal zone. There were no reported fish kills this year related to the use of agricultural pesticides, but several related to use of pesticides on ornamental turf. This has become a greater problem as the amount of managed turf grass in the coastal zone increases. Discussions about and investigations into the potential for impacts on coastal resources from other activities having intensive pesticide applications, including use by homeowners, continue to be subjects addressed by CPAC. This committee is viewed by many with regulatory and resource agencies, as well as representatives of various types of land use industries, as a very effective management tool.

EES continues to participate in and provide input into numerous projects related to non-point source (NPS) pollution. These included participation on the SCDHEC Non-point Source Task Force, the East Cooper Section 319 (Clean Water Act) NPS Project, the Stormwater Task Force of the Charleston Harbor Project, the task force and the Agriculture Committee for the Section 6217 (Coastal Zone Act Reauthorization Amendments) NPS regulations being developed by the

SCDHEC/OCRM, the Clemson Extension Service Agricultural & Natural Resources Advisory Committee, the S.C. Turfgrass Foundation Advisory Board and others, as well as the attendance at several workshops and conferences and the presentation of numerous talks and slide shows about the effects of NPS pollution on marine and estuarine resources.

During FY 1994-95, EES personnel participated in the investigation of a number of seasonal fish kills caused by low dissolved oxygen levels brought on either by algal blooms or by prior applications of aquatic herbicides, occurring 7 to 10 days after the application and during the time period when oxygen levels were greatly depleted due to the decomposition of plant matter. The large majority of these kills occurred in ponds originally constructed as a part of stormwater management systems in residential subdivisions or resort areas. Efforts continue to determine more proactive ways to address this problem. Due to the number of fish kills reported and the staff time required for response, EES personnel and District DHEC personnel continued to geographically divide the area in and around Charleston for response to kills which appeared to be caused by low dissolved oxygen levels. Proper notification to both SCDHEC and CUDFPC is provided if other causes are suspected after the site visit.

In FY 1994-95, EES personnel continued their participation in a variety of issues being addressed collectively by representatives of State (SCDNR, SCDHEC, and the Governor's Office) and Federal (USFWS and NOAA) Natural Resource Trustee agencies (NRT's). These activities include the review of documents (work plans, site investigations, Remedial Investigations, Feasibility Studies, etc.) and site visits to several existing and proposed Superfund Sites in the coastal zone and discussions, as well as participation in the planning process for environmental cleanup activities at Naval Base Charleston. Base personnel have incorporated participation by and input from Trustee representatives into the process of developing investigations of the various zones of the Base, as well as review of the various plans as they are developed. Other sites on which personnel have participated in NRT activities include the Wamchem Superfund Site in Beaufort, the Helena Chemical Company Superfund Site in Fairfax, the Koppers Superfund Site and the Calhoun Park Superfund Site in Charleston, and the National Park Service Site (Aquarium) in Charleston. It has been determined by the USEPA that the National Park Service Site will not be listed as a separate Superfund Site, but rather will be listed as an Area of Concern (AOC) for the Calhoun Park Superfund Site. The motive of all NRT activities on all Sites is to determine whether injury to natural resources has occurred, is occurring, or could occur from proposed activities from releases of hazardous substances from a particular site and, if so, what, if any, actions should be taken to facilitate accurate documentation of and compensation for losses. All NRT actions are conducted in conjunction with the SCDNR Office of General Counsel.

During FY 1994-95, EES personnel continued to provide technical support to the South Atlantic Fishery Management Council through participation on the Habitat and Environmental Protection Advisory Panel. A number of fisheries habitat related issues such as offshore disposal of dredged material, beach nourishment, various impacts to offshore live bottom habitat and impacts to estuarine wetlands and water quality were addressed. Comments from the Advisory Panel on pertinent issues or projects are forwarded to the Council for consideration.

Activities of the special area management plan (SAMP) for the Charleston Harbor estuary were begun in 1991 by the Office of Ocean and Coastal Resource Management of SCDHEC (formerly SCCC). Administered independently as the Charleston Harbor Project (CHP), this project is proposed to run for four years gathering information, identifying problems and providing priorities to appropriate regulatory, governmental, resource and public entities on environmental and land use issues. EES personnel participate on a number of "topic-specific" Task Forces, the stated purpose of which is to provide direction for and assist in guiding the activities of the CHP.

Continued use by EES of a computer-based relational database management system (RDMS) for the storage and analysis of various data generated through the regulatory process is an

important step toward the development of a comprehensive data management and analysis program for the Division. The database continues to be revised to provide for efficient, easy data entry and access to various OFM, MRD, SCDHEC and USACOE regulatory and technical information to facilitate marine and coastal environmental impact assessment and resource management. Although each group/agency maintains separate databases configured to suit their own specific needs, much of the information is mutually useful. Since all of these groups communicate and cooperate within the framework of the state/federal regulatory process, much of the data is exchanged or available for exchange in a effort to achieve a goal of administrative consistency and efficiency. The EES intends to continue to support the maintenance of this mutually beneficial database and to coordinate the entry of OFM and MRD resource and management data for common use. The EES database file structure is configured to maximize the utility for GIS applications.

The use of geographic information processing techniques for enhanced resource management and research continues at the MRD. With the entry of components of various coastal resource and infrastructure data sets into the system for query and analysis, the application of the MRD GIS to the EES continues to evolve. Appropriate spatial data, some identified during the process of RDMS development, is being entered into the GIS as layers to be overlaid onto a digital basemap. Various fisheries management data, permit application information, water quality and water chemistry data, marine and estuarine habitat information, terrestrial land use and land cover, and infrastructure will be eventually included. Technology such as GIS has become critically important in the support of resource conservation and management as coastal growth continues to expand alarmingly and human resources for marine and estuarine management do not increase at a complimentary rate.

#### **ECONOMIC ANALYSIS AND SEAFOOD MARKETING SECTION**

The overall purpose of this section is to apply economic analysis to public and private sector issues in the coastal area and to continue the Division's commitment to providing South Carolina's seafood producers and consumers with practical market information.

##### **Economic Analysis Programs**

A U.S. Department of Commerce MARFIN proposal entitled "Economic Assessment of Commercial Reef Fishermen in the South Atlantic Region" was initiated during this FY. The overall goal of this project is to provide economic data and analyses of commercial reef fishermen in order to facilitate better management of reef fisheries off South Carolina and other South Atlantic states. These data will assist the South Atlantic Fishery Management Council (SAFMC) and the National Marine Fisheries Service (NMFS) in evaluating management alternatives in the South Atlantic reef fisheries.

A related MARFIN proposal, "Socio-Demographic Assessment of Commercial Reef Fishermen in the South Atlantic," began in January, 1995. This project includes research by Clemson University sociologist Dr. Kenneth Backman at the Strom Thurmond Institute. The proposal focuses on providing socio-demographic data on commercial reef fishermen needed to evaluate the potential impact of management alternatives by the SAFMC and the NMFS. The lack of such data has been a major problem in the development of policies and management regulations for the snapper-grouper complex in the South Atlantic. Without data on commercial groups (users), such as boat owners, boat captains and crew members, it is increasingly likely that regulations will cause unexpected and undesirable impacts on these fishermen.

For the sixth year, financial feasibility analysis of shrimp farming was undertaken in conjunction with the Waddell Mariculture Center through a grant from U.S. Department of Agriculture (USDA). The overall purpose of this project is to identify production strategies for S.C. shrimp farmers that will yield the best profits for their cultured product. A graduate student assistantship in South Carolina State University's Department of Agribusiness and Economics was funded through this

USDA project. Under the supervision of assistant professor Dr. S. Sureshwaran at SC State University and the Section Supervisor, this graduate student analyzed the comparative financial feasibility of culturing two species of marine shrimp in South Carolina and the use of greenhouses to reduce shrimp farming risks. The utilization of greenhouse enclosed nursery raceways may be a viable method of increasing the growing season in South Carolina. Postlarvae (PL) are kept in nursery raceways until they reach the juvenile stage and are then transferred to growout ponds. Experimental research in South Carolina and other states indicates that nursery systems can improve the production (i.e. total quantity of shrimp harvested and average harvest size) of shrimp farms.

To evaluate the financial performance of this approach, a 24-ha growout shrimp farm in SC with and without a nursery system was simulated. In this analysis, it was assumed that the nursery system would supply about 20% of the farm's stocking requirements. Operating risks of the farm with and without the nursery system were stochastically simulated using triangular distributions and comparing risk effects on the farm's 10-year net present value (NPV). The expected mean value of the 10-year NPV for the growout with the nursery system was much higher than the farm without the nursery. Given the increase in NPV when partially stocking a growout facility with greenhouse nursery shrimp, it appears that a nursery system may be a viable financial alternative to reducing growout risks. Moreover, under conditions where PL supplies are limited, nursery systems may be the only practical way for temperate growers to reduce risks associated with PL availability. Additional financial analyses are needed on possible economies of scale and nursery effects on coping with PL seasonal supply risks.

The Section Supervisor served as a co-investigator on a S.C. Sea Grant Consortium administered project, "Demonstration and Evaluation of the Performance of a Tidal Powered Upwelling Nursery System in South Carolina. The overall goal of this project was to evaluate the feasibility and profitability of floating tidal-powered upwelling nursery systems for the commercial cultivation of hard clams, *Mercenaria mercenaria*. He produced a comparative economic evaluation of the tidal-powered upweller system (TPU) with bottom culture system and a land-based nursery systems.

### **Seafood Marketing Program**

The Seafood Marketing Specialist conducted market development activities and product promotions. This individual worked closely with the industry to keep abreast of market conditions and regulatory matters that might affect them. The Seafood Marketing Program is the primary source of marketing information for in-state dealers, processors, wholesalers and retailers, as well as a contact point for out-of-state suppliers, buyers and prospective dealers. It is also a readily available "answer line" for consumers with questions about seafood.

Promotion is one of the strongest aspects of the seafood marketing program. Slide presentations, cooking demonstration for groups, television appearances and "tastings" at festivals offer the seafood industry a great deal of positive exposure while educating the public on how to use and enjoy the state's excellent seafood. Staff also presented numerous cooking demonstrations, tasting events at festivals, appeared on over 12 television programs, helped organize the annual Shrimp Festival (1994) and the "Taste of Summer."

## **MARINE RESOURCES RESEARCH INSTITUTE**

The Marine Resources Research Institute (MRRI) provides the scientific expertise and capabilities required to support the MRD's coastal resource management activities. Institute scientists work closely with staff in the Office of Fisheries Management (OFM) to prioritize issues related to the state's important fisheries and other marine resources, identify information needs, and conduct the applied research and monitoring to obtain the needed information. MRRI is also responsible for developing the technology to support the state's growing aquaculture industry.



The Institute's research programs address three primary resource management needs of MRD: (1) fisheries monitoring and research; (2) environmental monitoring and research; and (3) mariculture technology development. Much of the mariculture research is conducted at the James M. Waddell Mariculture Center (WMC) located in Bluffton, S.C. Accomplishments for each of the Institute's major research programs during 1994-1995 are described below.

### **FISHERIES RESEARCH PROGRAMS**

**Program Background:** Since its inception, the MRRI has been responsible for the fisheries monitoring and assessment programs required to evaluate the status and trends of South Carolina's valuable fishery resources. These programs also develop monitoring and assessment technology to assess the condition of fishery stocks. These programs are primarily funded through grants from the National Marine Fisheries Service (NMFS).

**Coastal Finfish and Crustacean Surveys:** In 1994-1995, MRRI staff continued to monitor the status and trends of fish populations inhabiting offshore reefs as part of the NMFS-MRD Marine Resources Monitoring Assessment and Prediction Program (MARMAP). During 1995, 314 chevron trap and 14 hook and line sampling surveys were made to estimate relative abundance and obtain life-history data for target species. Approximately 3,500 fishes were tagged including gag, vermilion snapper, red porgy, white grunt, black sea bass and gray triggerfish. Declines in the catch per unit effort (catch/trap), changes in size and other life history characteristics, and population analyses suggested that red porgy, vermilion snapper and black sea bass populations were over fished. MRRI staff also continued status and trends monitoring for shallow water coastal living resources through the NMFS-MRD Southeast Area Monitoring and Assessment Program (SEAMAP) in 1994-1995. This program monitored abundance, biomass and composition of ground and pelagic fish and decapod crustaceans (shrimp and crabs) throughout the region. Abundance and biomass of priority species increased in 1994 and 1995. These data have been transferred to NMFS and are being made available to fishery managers and scientists throughout the region. Selected segments of these data (e.g., information for weakfish) were incorporated into reports to the South Atlantic Fisheries Management Council (SAFMC) and Atlantic States Marine Fisheries Commission (ASMFC). Information in these reports became important elements of fishery management plans.

**Life History Studies for Coastal Species:** MARMAP conducted life history studies on red porgy, snowy grouper, gag (grouper) and vermilion snapper. Long-term changes in growth rates, size-at-age and size-at-maturity suggest that red porgy and vermilion snapper populations were overfished. Declines in average size and the percentage of males from the late 1970's through 1994 suggested that gag populations were also overfished. Sampling of spawning adults and juvenile gag that recruit to South Carolina estuaries indicate that gag spawn in late winter off South Carolina and use marsh creeks as nurseries. Tagging studies as well as genetic markers are being conducted to determine if the offshore gag spawning population was the source of inshore recruits. Fisheries managers with OFM and SAFMC made numerous requests for summaries of MARMAP data in 1995.

**Finfish Genetic Studies:** The MRRI Fisheries Biotechnology Research Program develops and applies DNA technology (genetic markers) to define fishery management units (populations, stocks) and identify sources of recruits to South Carolina fisheries. In addition, DNA technology is used to support enforcement activities by providing species identification for tissue and egg samples. For example, this technology makes it possible to determine if a fillet or eggs confiscated by law enforcement officials are from a protected species. Much of the MRRI fish genetics work is funded through a NMFS grant and involves cooperative research with the University of South Carolina (USC) and the Medical University of South Carolina (MUSC). In 1994-1995, the MRRI genetics program used DNA technology to conduct stock identification studies for red drum, spotted seatrout, weakfish, gag, wreckfish and Nassau grouper. The MRRI genetics



program also continued to develop new genetics technology including nuclear DNA markers that can be used to define management units on a finer scale than is possible with existing conventional markers. MRRI genetics studies indicate that the South Carolina red drum stocks are distinct from those in the Gulf of Mexico, and that relatively few adult red drum contribute to the year class that is recruited to our estuaries. This information suggests that protection of red drum spawning grounds and reproducing adults is critical for sustaining harvests for this important fishery. South Carolina spotted seatrout are genetically distinct from Florida populations and should be managed as a discrete management unit. A MRRI fish genetics study, funded by the National Geographic Society and NMFS, applied DNA technology to identify the source of wreckfish found off South Carolina and to obtain the life history information needed to manage this important commercial species. As with many fish species that occur off our coast, wreckfish is distributed over broad areas of the North Atlantic with juveniles occurring in one area (eastern Atlantic) and adults in another (western Atlantic). DNA studies indicate that wreckfish in the North Atlantic comprise a single stock, and this stock is distinct from stocks in the South Atlantic and Pacific oceans. To ensure wreckfish are not overharvested, fishery managers must consider harvests that occur in the Azores and Madeira and coordinate management actions with resources managers in these countries. DNA studies of Nassau grouper show that the population of this rare species in the southeastern U.S. is distinct from Caribbean stocks. Management plans for this severely overfished species should consider Nassau grouper stocks to be self-recruiting.

**Inshore Finfish Monitoring and Research:** The objectives of the MRRI's inshore finfish monitoring and research programs are to: (1) determine the status and trends for recreationally harvested fishes; (2) obtain the information and conduct the analyses required to effectively manage these fisheries; and (3) disseminate the findings to resource managers, other scientists and the public. An important part of this research is identifying the location and condition of the spawning grounds and nursery habitats for highly valued species, like red drum. During the past year, the main emphasis of the Inshore Fish Monitoring and Research Program has been to define abundance trends for red drum, spotted seatrout, southern flounder, sheepshead and black drum. Funding for this work was provided by the U.S. Fish and Wildlife Service (USFWS) sport fish restoration fund, the NMFS through the Office of Special Grants and Contracts, and a three state study (Georgia, South Carolina, North Carolina) of red drum along the South Atlantic coast provided by the NMFS MARFIN program. Results indicate that escapement of sub-adult red drum out of the estuary into the offshore sexually mature population has increased. Changes to fishery regulations and public education efforts have apparently been effective at reducing the harvest of subadults to acceptable levels. No additional changes in fishing regulations are needed at this time to protect red drum. Population analyses, however, suggest that South Carolina's spotted seatrout populations are harvested at too small a size to obtain maximum yield from the fishery. Staff are currently evaluating a broad range of management actions that would provide the level of protection needed for this species and have minimum effect on recreational fishing. Both reduced bag and increased size limits are being considered. Southern flounders continue to be a bright spot for South Carolina inshore fisheries in 1994-1995. The population of this species appears to be stable and abundance levels are high.

**Sturgeon Bycatch Research:** MRRI staff also conducted research on sturgeon populations in 1994-1995 from assess the magnitude and fate of the sturgeon bycatch by the commercial shad fishery. Results of this study estimated that approximately 201 sturgeons were captured as by-catch in the Winyah Bay shad fishery during the 1995 fishing season. About 20% of these fish died prior to release, and about 24% of those fish released alive were injured to some degree and may have died later.

**Shrimp and Blue Crab Research:** Early life stages of economically important white shrimp and blue crabs move through coastal inlets from offshore spawning areas to marsh nursery

habitats. Several years ago MRRI staff initiated a series of studies to identify the factors that controlled the passage of early life stages of shrimp and blue crabs through inlets. During 1995, the final cruise of the North Edisto Inlet phase of this study was completed in collaboration with scientists from the Skidaway Institute of Oceanography. Results indicate that oceanic water carrying larval white shrimp is pushed through the inlet by strong Northeast winds in late spring. Information obtained about water movement and shrimp distribution and behavior from this study are being mathematically modeled to provide a tool that fishery managers can use to forecast shrimp movements through coastal inlets. The South Carolina and Georgia Sea Grant programs funded this research will continue in 1996.

**ACE Basin Reserve Research Program:** The MRRI's biological monitoring efforts in the ACE Basin National Estuarine Research Reserve during 1994-1995 focused on sampling fish, shrimp and crabs along the salinity gradient in each of the Reserve's three rivers. These data were used to characterize spatial distributions as well as to define trends for key living resources. Results of this program documents that the ACE Basin is an important nursery ground for fish and shrimp. In addition, MRRI staff began an intensive water quality monitoring program at two sites in the Reserve in March 1995. One site, Big Boy Creek, is located near the Town of Edisto Beach and was selected to represent a developed watershed. The other site, St. Pierre Creek, is undeveloped and was selected to represent pristine conditions. The objective of this monitoring effort is to characterize short and long-term variability in water quality at the two sites and use the data which are obtained to assess the impacts of non-point pollution on water quality in the Reserve.

A vegetation characterization of the Reserve was also initiated in summer 1995. The focus of the first phase of this study was to characterize the plant communities on South Williman Island which included estuarine as well as freshwater wetlands.

The MRRI initiated three contaminant studies in the Reserve in 1994-1995 to document historic and current patterns of chemical contamination for the Reserve. The first study evaluated historical trends in contaminants using sediment cores and was conducted in conjunction with Georgia's Skidaway Institute of Oceanography. This study concluded that concentrations of metals in the Ashepoo system have increased over the last 20 years, probably due to atmospheric deposition of contaminants. A second contaminant study conducted in conjunction with the NMFS-Charleston Laboratory found that the levels of chemicals in surface sediments of the Reserve were well below levels that are toxic to estuarine organisms. Sediment contaminant concentrations were highest in the South Edisto system where most of the anthropogenic activities in the Reserve are concentrated. The third contaminant study evaluated the impacts of docks constructed of treated lumber on sediment metal levels and bottom dwelling organisms. This study was conducted by Rutgers University and concluded that metal leachates from the pilings, even recently installed ones, have negligible impacts on sediment metal concentrations and biota.

Information produced by ACE Basin's Research Program was integrated into the Reserve's education program that included boat trips, trail walks, teacher workshops and a variety of outreach activities. In addition, the ACE Basin Reserve Research Program sponsored a seminar series for the general public that was held in the Charleston and Beaufort areas.

**Oyster Reef Research Program:** In recent years, a major focus of the MRRI's Shellfish Research Section has been to obtain a better understanding of the ecological value of oysters and the habitat they form to South Carolina estuaries. During fall 1994, six experimental oyster reefs were constructed at two study sites (one developed and one relatively undeveloped) using grants from the South Carolina Sea Grant Consortium and the Marine Recreation Fishing Advisory Board. These reefs and adjacent natural reefs were sampled in 1995 to define the resident and transient fish, shrimp and crabs that used them as nursery habitat, feeding grounds

and/or refuge. Preliminary findings indicated that abundant populations of highly valued fish, shrimp and crabs occur on experimental and natural reefs including red drum, gray snapper, flounder, sheepshead, spot, white and brown shrimp, as well as stone and blue crabs.

**Shellfish Disease Monitoring and Research:** Oyster pathogens, including MSX and Dermo, have devastated oyster populations in many mid-Atlantic states resulting in losses of hundreds of millions of dollars in fishery harvests. The focus of the MRRI Shellfish Disease Monitoring and Research Program in recent years has been to develop baseline information on the prevalence and intensity of Dermo and MSX in South Carolina oysters and to use the information obtained to develop a statewide oyster disease monitoring program. Before an effective and efficient oyster disease monitoring program can be developed, basic information on the epidemiology of oyster diseases and reliable methods to detect them must be developed. Therefore, in 1994-1995, MRRI staff worked with disease experts at the Virginia Institute of Marine Science, USC, NMFS and private industry to improve our ability to detect oyster diseases. We also compiled and analyzed historical data for oyster diseases. Over 1,000 oysters were examined for Dermo; 1,400 for MSX; and 500 for condition indices. Monthly monitoring for the oyster pathogen Dermo and MSX was also initiated at the two experimental oyster reef sites identified above as well as in the Fort Johnson area. We developed the first seasonal data set for both Dermo and MSX for South Carolina. Staff also examined oysters from 21 sites across the state during the critical summer period. Dermo was present at all sites, and MSX was present at 48% of them. These data indicate that oyster pathogens are broadly distributed in the state and have important implications to policies related to the movement of oysters from one location to another. In the future, we plan to explore possible reasons why South Carolina oysters have not undergone the mass mortalities from disease observed in other regions. Preliminary information suggests our intertidal oysters may have a natural resistance to Dermo and MSX.

**Shellfish Hatchery Operations:** Oysters are often used as test organisms in research because they are easy to manipulate, have rapid growth and are sensitive to a broad range of pollution insults. The MRRI shellfish hatchery produces juvenile oysters for in-house research as well as for research conducted by scientists at other state institutions (e.g., USC, Clemson University (CU), University of Charleston (UOC)). In 1995, MRRI staff developed protocols for production of specific pathogen free (SPF) oysters and produced approximately 25,000 SPF juveniles. A subset of these SPF juveniles are being maintained in the hatchery under quarantine conditions for future disease research, including evaluation of the resistance of native oysters to disease and the feasibility of developing a breeding program to enhance disease resistance. The remainder of the SPF oysters will be used for research projects, including evaluation of oyster reef function and pond production studies, habitat evaluation studies, sediment toxicity studies, aquaculture research, and disease epidemiology evaluations.

## **ENVIRONMENTAL RESEARCH PROGRAMS**

**Program Background:** The Institute's Environmental Research Section (ERS) is responsible for obtaining the data needed to understand the consequences of various human-related activities on the State's marine and estuarine resources. To fulfill this responsibility, MRRI staff develop and conduct studies that: (1) evaluate the impacts of specific perturbations; (2) quantify pollution exposure and ecological condition for our estuaries and coastal waters; and (3) conducts the toxicological studies required to predict the impacts of pollution exposure on living resources. Information produced is used by OFM and the Department as a basis for comments on permit requests and environmental policies, standards, and criteria proposed by regulatory agencies, including the South Carolina Department of Health and Environmental Control (SCDHEC) and the U.S. Environmental Protection Agency (USEPA). For the last several years, research programs conducted within the ERS have focused on developing the monitoring technology needed to assess the health of our estuaries, collection of the information needed to

comment on dissolved oxygen standards and sediment quality criteria developed by the SCDHEC and USEPA, and developing the data needed to assess the relative value of critical estuarine habitats.

**Beach Nourishment Assessments:** Because of the severe erosional problems that occur along much of the state's coastline, a number of towns and cities have initiated beach nourishment programs. These programs have improved the recreational value of the state's beaches as well as increased the protection of coastal properties from storm damage. However, beach nourishment projects impact living resources inhabiting beaches and the adjacent areas that serve as borrow sites. In 1994-1995, MRRI continued to monitor and assess the impacts of beach nourishment on coastal resources. These studies were supported by the U.S. Army Corps of Engineers (USACOE) and included completing monitoring and assessment studies for the Folly Beach Nourishment Project and collection of the baseline information for a major beach nourishment project scheduled for the Myrtle Beach area in 1996.

Results obtained from the Folly Beach study indicated that impacts to the beach and surf zone biota were small and lasted only a few months. Longer-term impacts were, however, found in the Folly River, which was dredged to obtain the sand used to nourish the front beach. Bottom sediments in the Folly River borrow areas changed from a relatively clean, sandy sediments to soft muds. The accumulation of mud reduced the value of the area for future nourishment operations and resulted in substantial changes to the bottom-dwelling fauna. Based on these findings, the DNR recommended that in the future the USACOE should identify borrow sites that are not likely to fill with soft sediments.

The Myrtle Beach Nourishment Project will involve dredging sand from several offshore borrow sites and placing it along 24 miles of beach between Little River Inlet and Murrells Inlet. In 1995, MRRI biologists, working in conjunction with geologists from the Center for Marine and Wetland Studies (CMWS) at Coastal Carolina University, began collecting baseline data for the diversity, abundance and seasonal variability of bottom-dwelling communities, sediment characteristics and the location of hard-bottom reef habitat from potentially affected areas. These samples will be processed in 1996 and used in later years as the basis for assessing impacts.

**Task Force on Offshore Resources:** In 1993, representatives from several state agencies established a Task Force on Offshore Resources using a grant from Minerals Management Service (MMS). MRD is the lead agency for the Task Force. The primary goal of the Task Force is to map the location, distribution and extent of bottom resources off the South Carolina coast, including sand deposits for beach nourishment projects. During 1994-1995, the Task Force completed an analysis of the available physical and biological data from the nearshore zone of South Carolina, evaluated historical trends in shoreline movement for selected barrier islands, and conducted a survey of bottom habitats near Folly Beach. Three reports describing these studies were published and distributed to governmental agencies and libraries. Additionally, the Task Force began a survey of bottom resources off Edisto Island as well as a project to evaluate filling rates and sediment characteristics of beach nourishment borrow sites.

**Ocean Dredged Material Disposal Monitoring:** The Charleston Ocean Dredged Material Disposal Area (ODMDS) was recently relocated due to concerns raised about impacts on ecological processes at the historically used disposal site. An environmental monitoring and assessment program was required to ensure that disposal activities for the "new" site did not result in similar adverse impacts to surrounding habitats. In 1994, several agencies, including the USEPA, the USACOE and the MRRI, coordinated their activities and pooled their resources to define baseline conditions at the "new" ODMDS. The MRRI was responsible for collecting, processing and evaluating the over 400 bottom samples that were taken and using the data produced to characterize the bottom-dwelling fauna and sediment characteristics for the "new" site. Laboratory processing of the 1993 samples was completed and processing of the 1994

samples was initiated. The data, which will be available in 1996, will be the basis used for assessment of the impact of dredged material disposal in at the "new" site.

**Estuarine Monitoring and Assessment:** During 1994-1995, MRRI staff continued to evaluate environmental and ecological conditions in South Carolina's estuaries. This work was funded by the National Oceanic and Atmospheric Administration (NOAA) and was part of the joint NOAA/USEPA Estuarine Monitoring and Assessment Program (EMAP). For EMAP, the MRRI completed a pilot study evaluating the adequacy of environmental quality indicators used nationally for application in the southeast. Staff also identified and tested several new indicators for measuring the biological health of estuaries. A report detailing results of the pilot study was prepared and submitted to NOAA. The full-scale EMAP study that involved sampling at 83 core stations from Cape Henry, Virginia, to Indian River Lagoon, Florida, was implemented in summer 1994. MRRI was one of three principle cooperators on this study responsible for collecting samples from South Carolina and Georgia. The MRRI was also responsible for conducting all toxicity testing for EMAP. Fifty-four percent of the sites samples in South Carolina and Georgia showed no evidence of anthropogenic impacts. Twenty-one percent had contaminant levels that would be expected to cause chronic or acute effects to biota; and 25% of the sites showed evidence of biological effects. Adverse effects on growth, increased bioaccumulation of metals, and increased incidence of disease were also observed with oysters deployed at sites with high contaminants levels.

**Tidal Creek Habitat Assessment:** The Tidal Creek Project which began in January 1994, studied 24 creeks in the Charleston area, and collected information on water quality, sediment quality, the condition of benthic and fish communities, land cover, and human population density. This study was funded by a grant from the Office of Ocean and Coastal Resource Management (OCRM) of the SCDHEC through the Charleston Harbor Project. The goal of this study was to assess the ecological responses of tidal creek habitats to watershed development. Findings suggest the major environmental impacts of watershed development on tidal creek nurseries are increases in the amount of chemically contaminated sediments in the upper reaches of creeks. Sediment chemical concentrations in the upper reaches of some developed creeks attained levels that adversely affect biota. Oxygen dynamics in tidal creeks were complex, and the low dissolved oxygen conditions which occur in most tidal creeks appear to be important attributes of good nurseries.

**Toxicology Research:** During 1994-1995, MRRI staff conducted comparative toxicity tests on two estuarine fish using azinphosmethyl, a pesticide spread on farmlands in South Carolina. The goal of this research was to determine whether the responses of the fish species recommended by the USEPA and the SCDHEC for evaluating chemical toxicity (mummichogs) in estuarine water and sediments was representative of the responses of high valued species that occur in South Carolina estuaries (red drum). Results of this study found that red drum were significantly more sensitive to azinphosmethyl than mummichogs and underscore the need to use highly valued species in assessments of pollution impacts on South Carolina marine and estuarine systems. Another toxicity study conducted by MRRI staff involved comparing the sensitivity of six species of invertebrates to sediments containing three model contaminants (DDT, cadmium and fluorethene). This study is being conducted jointly with the NMFS-Charleston Laboratory and USC. The cadmium assays were completed during 1994-1995 and demonstrated a local crustacean and seed clams were the most sensitive species tested. Remaining assays will be completed in 1996.

**Bioaccumulation of Toxics:** A study of mercury bioaccumulation in tissues of estuarine finfish was completed during 1994-1995 by MRRI staff. Species sampled included mullet, spot, red drum, sea trout and flounder. Specimens were collected from Winyah Bay, Cape Romain, Charleston Harbor, St. Helena Sound, Port Royal Sound and Calibogue Sound. None of the

specimens had tissue concentrations above U.S. criteria for human consumption, and only 27% had any mercury in their tissues. In addition, a study was initiated to determine whether chemicals that existed in the hulls of ships that were sunk off South Carolina to create artificial reefs were bioaccumulated by living resources. Preliminary results found no detectable concentrations of chemicals in finfish and a variety of encrusting organisms. During 1996 we hope to expand this effort using support from the U.S. Navy.

### **MARICULTURE RESEARCH PROGRAMS**

**Program Background:** Development and utilization of fish and shellfish aquaculture technology has become increasingly important in South Carolina because of the potential for this technology to mitigate the impacts of an expanding human population on overutilized marine fisheries. Current fish and shellfish mariculture projects at the MRRI include: (1) identification of culture requirements for important marine and estuarine species; (2) examining stock enhancement as a tool for restoring and improving fishing opportunities; (3) development of commercial mariculture farming technology for shrimp, clams, oysters and fish; (4) development of technology to minimize the impacts of aquaculture operations on receiving water bodies; and (5) providing extension services to transfer mariculture technology to the private sector. In addition, the mariculture section routinely provides animals, expertise and holding facilities to other state and federal programs.

**Striped Bass/White Bass Aquaculture:** Research on the development of methods to produce domesticated striped bass and white bass brood stocks continued in 1994-1995. These methods are designed to improve the efficiency of hatchery operations and decrease the dependence of striped bass farmers on wild brood fish. During 1995, research demonstrated that white bass brood stock could be spawned at least twice. Researchers also demonstrated that the white bass spawning season could be extended for three months by holding brood fish at light levels and temperatures representative of spring conditions. If implemented, these practices would allow greater flexibility in hatchery operations as well as increased hatchery production over a spawning season. MRRI staff also conducted research to improve larval rearing techniques for white bass and hybrid striped bass. These studies focused on evaluating the effect of lighting, tank color and diet on larval growth and survival. Results indicated that high lighting and dark tanks, which provided good prey contrast, were essential for early feeding success.

**Flounder and Spotted Seatrout Culture:** Flounders are an economically important species that are sold in most seafood markets and restaurants. In recent years, commercial landings and market availability of some flounder species have declined, resulting in high consumer demand for this species. In 1994-1995, MRRI staff initiated research to define the culture requirements of the southern flounder, the most abundant flounder species in the southeast. This work is being conducted cooperatively with North Carolina State University. Nearly 1.8 million eggs were stripped from flounder females which had been induced to spawn with hormonal implants. Approximately 50% of the fertilized eggs hatched, and fry were split between researchers in South Carolina and North Carolina for a variety of larval rearing experiments. In addition, a portion of the larvae were stocked into ponds to produce juveniles. Nearly 1,700 small flounders were harvested from the ponds providing the first documented pond production of southern flounders. Initial culture research with spotted seatrout were also implemented in 1994-1995. For this work, adult fish were successfully conditioned to repeatedly tank-spawn. The fry produced were stocked in a pond, and small juveniles were produced. Although this technique has been used in other states, this is the first time these methods have been shown to be applicable to South Carolina. Development of culture techniques for flounders and spotted seatrout will provide MRRI staff the tools needed to assess commercial aquaculture and stock enhancement potential for these important species in future years.

**Red Drum Culture:** The MRRI red drum culture program focused on developing protocols for improving fingerling production in 1994-1995. By manipulating water temperature in conditioning and spawning tanks, brood stock spawning could be precisely predicted. Using this technology, a small group of brood fish (5 males, 4 females) produced over 97 million larvae. The improved predictability in spawning allowed staff to better prepare ponds for fry. As a result, average red drum fingerling production increased from 27,000 to 306,000 per acre. Stock enhancement studies for red drum also continued during 1994-1995. In previous years (1992-1993) the focus of our red drum stock enhancement efforts had been on stocking relatively large fish (8-14 inches). The focus of the 1994-1995 efforts was shifted to evaluating the effectiveness of stocking small (1-2 inch) red drum. This change was made because: (1) small fish can be produced at a lower unit cost than larger fish; (2) small fish are not as susceptible to bird predation during culture; and (3) a method of differentiating wild and stocked fish was developed which eliminated the need for and expense of externally tagging each fish prior to release. Stocking of small marked (oxytetracycline dipped) red drum was initiated in June 1995 and will continue for the next 2 years. Sampling will be conducted in the estuary to determine the relative contribution of stocked fish to the wild population.

**Penaeid Shrimp Culture:** The MRRI's marine shrimp farming program, largely funded through the U.S. Department of Agriculture, continues to make significant advances in the pond culture of shrimp. This program identifies, develops, and evaluates technology in all areas of shrimp farming including: (1) broodstock evaluation; (2) maturation system performance; (3) amplification of selected broodstock lines; (4) larval rearing research; (5) larval quality assessment; (6) seed stock quality assessment; (7) disease diagnostics; (8) shrimp species assessment; and (9) technology transfer.

Brood shrimp produced in South Carolina are free of many diseases that may exist in brood stocks from other geographical areas. In 1995, high-health white shrimp, brown shrimp and blue shrimp postlarvae reared at the WMC were stocked in a commercial pond for brood stock production. At the end of the season, staff removed the brood stock needed for the 1996 spawning season, and the farmer distributed the remaining brood shrimp to commercial hatcheries which supply South Carolina farms. As a result, the WMC did not have to utilize research pond space for brood stock production, and the supply of high-health brood stock for hatcheries serving the South Carolina farmers were increased.

The diet required for successful maturation and reproduction of white shrimp typically includes expensive marine bloodworms. In 1994-1995, the MRRI staff evaluated several alternative diets that did not include bloodworms. One of the alternate diets, brine shrimp, bioencapsulated with a menhaden fish oil emulsion, was less expensive and performed as well as polychaete enriched diets. During 1994-1995, MRRI staff also completed an evaluation of using industrial salts to maintain shrimp hatchery salinity at acceptable levels during periods of heavy precipitation. Results confirmed that inexpensive food grade salt can be added to low salinity water and effectively increase salinity improving survival rates of hatchery-reared larval shrimp.

Research on production of indigenous shrimp species continued in 1994-1995. Growth and survival tests showed white shrimp was the best performer of the three native species for food shrimp production. Brown shrimp and pink shrimp were more desirable for fishing bait production because they remained at a smaller size for a longer period of time.

In 1994-1995, WMC continued to provide shrimp disease diagnostic services to South Carolina shrimp farmers as a means of identifying potential disease problems and to prevent introduction of non-indigenous pathogens into state waters. To improve the effectiveness and responsiveness of our disease diagnostic services, kits for preserving disease samples were prepared and provided to farmers. Samples were obtained from all farms and each stock at the WMC. No pathogens were found at the WMC or any commercial operation.



**Development of Sustainability Mariculture Technology:** With the development of economically viable mariculture production technology for several different food products (e.g., fish, shrimp, clams) and the expansion of the mariculture industry along the South Carolina coast, concerns have been raised that the environmental impacts of discharges from culture operations need to be minimized. In response to this concern, WMC staff have undertaken a research program to identify, develop and evaluate technologies that minimize environmental impacts.

Effective land utilization is an important environmental issue because as the demand for coastal land increases, culture operations will be forced to use as little land as possible. WMC staff developed intensive production technology (growing more fish/shrimp in less space) from 1992-1995 that minimized land requirements. Reduction in water use by mariculture operations would address many environmental concerns including: (1) over-enrichment of the adjacent estuary from nutrients in pond effluents; (2) mortality of estuarine biota from entrainment in pumps; and (3) escapement of non-indigenous, genetically altered and/or diseased live stock. In 1994-1995, research conducted at the WMC demonstrated that the elimination of routine water exchange (with the benefit of elimination of pond effluents) had minimal effect on production of shrimp and fish. An economic analysis of these data revealed that while profits may be slightly reduced when water exchange is eliminated, the decrease in profits was offset by the reduced costs for pumping equipment and electricity and the expense associated with obtaining discharge permits.

Protein transformation is the process of converting feed into edible product. Feed conversion studies conducted at the WMC in 1994-1995 demonstrated that using existing technology, as little as 1.4 pounds of feed could produce a pound of shrimp. Only a few years ago, the industry norm was 2 to 2.2 pounds of feed per pound of shrimp produced.

Another approach to reducing effluent impacts and improving protein transformations is to combine fish and/or shrimp culture with oyster and clam culture. The fish or shrimp are nourished on commercial feeds, and their metabolic and feeding activities create a nutrient-rich waste which fertilizes a dense plankton bloom. This plankton is then used to produce clams and oysters. However, for this approach to be commercialized, the oysters and clams grown in ponds with shrimp must be shown to be suitable for human consumption. In a study completed at the WMC in 1994-1995, human pathogen levels in pond water and oysters reared in ponds and raceways with shrimp were compared to human pathogen levels for water and oysters from a nearby site approved for shellfish harvest. The results of this study demonstrated that the concentration of potential pathogens was lower in water and oysters from WMC ponds and raceways than in the adjacent estuary. Thus, pond-grown oysters may actually provide additional protection to humans, while simultaneously converting potential pollutants into a valuable seafood product.

**Clam Mariculture Studies:** In 1994-1995, the MRRRI staff concluded a collaborative effort with South Carolina Sea Grant Consortium and a private clam farmer for development of a tidal-powered clam nursery using funding from the National Coastal Resources Research Institute. A demonstration video describing the approach and a construction and operations manual for the nursery were produced and distributed to the general public. Manuals were also sent to potential users throughout the United States and Canada. The interest generated by this project has led to the development of a second proposal to expand upon the original research. A grant for the second proposal is expected to begin in Spring 1996.

#### **EDUCATIONAL ACTIVITIES**

**Program Background:** The MRRRI serves as a seaside facility for the state's academic institutions, and MRRRI staff actively participate in cooperative research and education programs with the state's colleges and universities. Most of the Institute's scientists have adjunct appointments with the University of Charleston (UOC), the Medical University of South Carolina (MUSC), Clemson University (CU), South Carolina State University (SCSU), and/or the University



of South Carolina (USC). As part of its academic responsibilities, MRRI maintains a marine and environmental science library in cooperation with the UOC. The MRRI programs related to educational activities conducted during 1993-1994 are summarized below.

**Grants, Undergraduate, High School and Public Education:** MRRI's commitment to higher education continued during 1994-1995. Staff functioned as research advisors and committee members for students from the UOC Marine Biology Program, the MUSC's Marine Biomedical and Environmental Sciences program, USC, CU and several other regional academic institutions. To date, 50% of the 80 graduate students who have finished Master's degrees at the UOC have been guided by one or more MRRI/MRD scientists. Staff also taught several graduate and undergraduate courses and classes at UOC and The Citadel. Other educational and training projects in which MRRI staff were involved included mentoring undergraduate and high school students in internship programs, helping with teacher workshops and in-service training, seminars and civic presentations, and participating in environmental promotions such as MRD Fishing Fair, the Sportsman's Classic, and the Southeastern Wildlife Exposition. MRRI staff made 98 presentations to the general public and scientific community reaching an estimated 8,648 individuals. A report summarizing the historical role of the MRRI/MRD in marine science education is in preparation and scheduled for completion in 1996.

**Minority Training and Recruitment:** A summer training program for undergraduate minority students was coordinated by MRRI staff again in 1995. This mentor-based program is designed to increase the numbers of minority candidates applying for technical positions within the MRD and increase minority interest in careers in marine and environmental sciences. Five students representing Benedict College, Claflin College, Coker College and USC Aiken participated in the program by completing independent research projects in environmental science, photo-journalism, economic analyses, environmental chemistry and fisheries biology. Students made oral presentations on their summer projects to MRD staff and to their home institutions. This was the first year that we offered on-site housing to students, allowing us to attract students from non-coastal counties. The NMFS Charleston Laboratory provided a grant to assist us with our minority recruitment efforts.

**Marine Resources Library:** The Marine Resources Library (MRL) continued to strengthen its collection as well as to improve access to the collection for students, faculty, MRRI staff and the public. MRL patrons checked out over 4,506 books, journals and reprints during 1994-1995. This represents a 4% increase over 1993-1994. In addition, the MRL Librarian provided 14 orientation tours to 168 patrons, and the MRL staff answered 4,587 reference questions -- a 32% increase over 1993-1994. A marked increase in the number of requests from the general public for information about aquaculture occurred in 1995. As an added responsibility over this period, the MRL Librarian served as a consultant to the NMFS-Charleston Laboratory, which did not have a librarian to manage their collection.

Over 300 new titles were added to the MRL collection in 1994-1995. This represented a decrease in the number of volumes added in most other recent years. The decrease resulted because the Collection Development Committee recommended the purchase of the volumes needed to complete two major treatises in marine science. The addition of these volumes greatly enhanced the quality of our collection, but they were expensive limiting the total number of volumes that could be purchased. The total number of volumes in the cataloged collection is 19,218, and the total number of pieces in the cataloged microfiche collection is 1,276. During 1994-1995, the library added no new serial titles; however, we obtained the 1994 *Zoological Record* on CD-ROM as well as continued our subscription for this periodical in hard copy. This allowed students, faculty and staff to evaluate and compare the advantages and disadvantages of the two formats for this periodical. In 1996, the Librarian working with users, advisory committees and her funding sources will make a decision about which format the library will

obtain for this and other periodicals in the future. The library discontinued two periodical subscriptions in 1994-1995; one ceased publication and the other was not renewed because the project that requested it no longer found it useful. The library currently receives 387 serial titles through subscription, exchange, donation and the Federal/State Depository System. During 1994-1995, bound periodicals increased by 65 volumes bringing the total to 8,226 volumes.

The library continued the exchange program with 81 exchange partners, including foreign and domestic institutions. This program is sponsored by the International Association of Marine and Aquatic Science Libraries and Information Centers. This exchange program has provided MRL access to free copies of many serial publications. Library patrons made over 475 interlibrary loan requests (an increase of 10% over 1993-1994). Over 91% of these requests were filled. MRL received 616 requests for information (an increase of 16% over 1993-1994). The requesting library was provided the needed material 64% of the time. Most of the unfilled requests were because the MRL did not have the specific volume or issue requested.

The MRL received two gift collections during 1994-1995. One was from the library of Dr. Robert F. Hutton, a well-known marine biologist who was associated with the SCDNR early in his career. The other donation was from the SAFMC. Each collection totaled several hundred items and contained monographs, serial publications, technical reports and reprints. These additions strengthen our library holdings.

No reprints were added to the reprint collection during 1994-1995. The collection now consists of 23,868 pieces. Development of a data base for the reprint collection included information about the titles, author(s), and key words was initiated using the AskSam software. Records for over 1,000 reprints were entered into this data base. When this data base is completed, users will be able to identify reprints using computer searches based on key words, title and/or author.

The MRL Librarian chaired a committee which was charged to evaluate the feasibility of merging the NMFS-Charleston Laboratory library holdings into the MRL resulting in a single library at Fort Johnson. The committee concluded that the two libraries could be combined into a single collection of higher quality that could be operated at reduced overall cost. Actions to combine the two libraries are planned for 1996-1997.

## WATER RESOURCES DIVISION

The Restructuring Act of 1993 transferred as of July 1, 1994, the former Water Resources Commission's water management and planning programs to the Department of Natural Resources (DNR). The former Commission was established by the South Carolina Water Resources Planning and Coordination Act of 1967. This act requested the Commission, and now the Division, to consider all relevant water resources issues, needs and activities and to advise the Governor and General Assembly thereof.

The Water Resources Division is responsible for conducting programs that foster water resources planning, protection and development. This is accomplished by conducting hydrologic studies of the state's surface and groundwaters to insure adequate supplies of water for public supply, industry, recreational users, hydroelectric producers, and ecosystem maintenance. The Division serves as the focal point for climatological matters for State government and provides climate information and services to both public and private sectors. Environmental resource programs include work to control nuisance aquatic plants and animals; river planning studies; administration of the State scenic rivers program; and development of basinwide resource assessments.

The Division is overseen by an advisory committee, appointed by the DNR Board, whose members represent all types of major water use interests: agriculture, industry, municipalities, and saltwater. Membership during FY 94-95 included: Lynn H. Youmans, Jr., Chairman, Furman; Tom W. Dunaway, III, Vice Chairman, Anderson; Robert M. Rainey, Greenville; Earl Hayter, Water Resources Research Institute, Clemson University; Ben M. Gramling, Gramling; Houston F. "Dick" Crater, Jr., Gaffney; Kitty Updike, Tega Cay; Ralph A. "Nick" Odom, Jr., Fort Mill; Whitemarsh S. Smith, Charleston; Lewis Walker, Sumter.

During FY 1994-95, the Division was composed of four sections: Environmental Affairs, Hydrology, Office of State Climatology, and Resource Assessment and Planning. Each section's responsibilities and accomplishments are reviewed below.

**Mission Statement:** The mission of the Division of Water Resources is to manage the State's water resources as an interlinked hydrologic system; to protect these resources as a public trust through the employment of science, technology, and public involvement; and to provide for the maximum reasonable and beneficial use of these resources.

### ENVIRONMENTAL AFFAIRS SECTION

#### PROGRAM - AQUATIC PLANT AND ANIMAL MANAGEMENT

Statutory Authority: Chapter 6 of Title 49 (Sections 49-6-10 thru 49-6-40) creates the aquatic plant management program for which DNR is responsible.

**Relation to Division Mission:** The purpose of the Aquatic Plant Management Program is to manage and control nuisance aquatic weed infestations in public waters of the State. Such nuisance weed populations can adversely impact virtually all beneficial surface water uses including public supply, industrial supply, electric power production, navigation, and recreation. The Aquatic Plant Management Program utilizes science (aquatic ecology), technology (chemical, biological and physical plant control methods) and public involvement in development of management objectives and strategies to protect the surface water resources and prevent aquatic weeds from interfering with the beneficial and reasonable use of these resources.

The Zebra Mussel Program seeks to prevent or delay introduction of the nuisance zebra mussel to South Carolina waters and to develop a strategy to control the mussel if it becomes established here. Zebra mussels pose a serious potential threat to all uses of South Carolina's surface water resources and to the aquatic environment. Control of this nuisance mussel will be

essential to protecting the beneficial uses of our rivers and lakes.

**Program Goal:** To eliminate or minimize adverse natural resource impacts from noxious aquatic plants and animals.

**Program Objectives:** To identify public water bodies where plants are causing water use impairment. To reduce the abundance of aquatic plants, such as hydrilla, at specific sites where they interfere with the use of public waters. To improve noxious aquatic plant and animal management knowledge and methods through research. To provide technical information and assistance to water users, other agencies and the public regarding noxious plants and animals. To prevent the introduction and distribution of noxious exotic aquatic plants and animals. To develop a standardized monitoring procedure for zebra mussels and other noxious aquatic animals and plants. To coordinate all aquatic plant management and zebra mussel activities for South Carolina.

**Performance Measures:**

Aquatic Plant Management Program:

Workload Indicators: (FY 1994-95)

1. 25 lakes/ivers surveyed for aquatic plant problems
2. 28 water bodies treated with aquatic herbicides and/or biological control agents (19,258 acres)
3. S.C. Aquatic Plant Management Council meetings were held in January, June and November.

Efficiency Measures: (FY 1994-95)

1. Cost per acre of water to control aquatic plants:  
Total Funds (Federal, State, Local) = \$149/acre  
State Funds = \$10.68/acre

Effectiveness Measures: (FY 1994-95)

1. 35% of all public lakes surveyed
2. 47% of all infested areas identified in Annual Management Plan receiving treatment.

NOTE: Grass carp stocked in upper Lake Marion in 1989-92 continued to control hydrilla growth in over 9,000 acres in 1994.

**Performance Measures:**

Zebra Mussel Program:

Workload Indicators: (FY 1994-95)

1. Conducted meeting of the S.C. Zebra Mussel Task Force.
2. Distributed 10,000+ public information cards and brochures on zebra mussel problem and prevention methods.
3. Gave numerous presentations on the zebra mussel threat to water user groups including the S. C. Rural Water Association, S.C. Bass Federation and Catawba-Wateree Water Users Association.
4. Zebra mussel articles were published in the Journal of the S. C. Water Pollution Control Federation, S. C. Wildlife Magazine and numerous newsletters and newspapers.
5. Presented displays and distributed literature at the Palmetto Sportsman's Classic, State Fair, Myrtle Beach Wildlife Exposition and Annual Meeting of the S. C. Aquatic Plant Management Society.
6. Coordinated follow-up investigations on numerous reported zebra mussel sightings.

Efficiency Measures: (FY 1994-95)

1. 95 staff hours were expended on all program functions.

Effectiveness Measures: (FY 1994-95)

1. Public knowledge of the zebra mussel threat has greatly increased.
2. Zebra mussel monitoring is being conducted by a number of larger water users in

the State.

3. Division staff have been trained in zebra mussel larval identifications and this service is being made available to water users.
4. Even though zebra mussels are widely distributed throughout the eastern United States, they are still not known to occur in South Carolina.

#### **PROGRAM - ENVIRONMENTAL REVIEW**

Statutory Authority: Chapter 3 of Title 49 (Sections 49-3-10 thru 49-3-50) outlines the responsibilities of the Division in conducting water resource planning, policy and coordination of those policies among other State agencies.

**Relation to Division Mission:** The purpose of the Environmental Review Program is to coordinate scientifically supported interdivisional review of environmental permit applications and other environmental actions affecting natural resources and to insure that water resources input is included in this review process. In order to insure the maximum reasonable and beneficial use of water resources, it is essential that such use and the use of associated natural resources (biological and land) is conducted in an environmentally appropriate manner. Adverse environmental impacts to water and other natural resources are detrimental to the reasonable and beneficial use these resources.

**Program Goal:** To coordinate agencywide review of environmental permit applications and other actions affecting natural resources in the 38 non-coastal counties of the State and to provide Water Resources Division input to this review process.

**Program Objectives:** To maintain a thorough knowledge of all local, state, and federal environmental regulatory programs that affect the State's natural resources. To receive notices of all relevant environmental review requests and, utilizing the DNR's environmental review process, to coordinate review of such requests among the various divisions of the agency. To ensure that comments and positions on environmental reviews are scientifically sound, reasonable and conform to DNR policies and procedures. To insure that DNR comments and positions on environmental reviews are unified and that the agency speaks with one voice. To monitor the success of DNR comments and positions in influencing environmental regulatory decisions. To monitor the environmental review process to identify needed scientific information and policies to enhance division and agency positions on environmental issues. To insure that Water Resources Division interests are represented in the environmental review process.

#### **Performance Measures:**

##### Workload Indicators: (FY 1994-95)

1. 1,344 non-coastal environmental review requests were received, coordinated and responses provided.
2. Regular, usually weekly, coordination meetings were conducted for inter-divisional non-coastal environmental review staff.
3. Many site visits and coordination meetings with DNR staff, regulatory agency staff and permit applicants were held for specific projects being evaluated.
4. Files were maintained for all 1,344 non-coastal reviews performed.

##### Efficiency Measures: (FY 1994-95)

1. An average of 2.8 staff hours per review was expended in coordinating and evaluating environmental reviews.

##### Effectiveness Measures: (FY 1994-95)

1. Approximately 95% of DNR recommendations were accepted and implemented by the agency or entity requesting agency review.

#### **PROGRAM - LABORATORY SERVICES**

Statutory Authority: Chapter 3 of Title 49 (Sections 49-3-10 thru 49-3-50) outlines the responsibilities of the Division in conducting water resource planning, policy and coordination of

those policies among other State agencies. Section 49-3-40 authorizes the formulation of a comprehensive water resources policy for the state and the conduct of appropriate studies and analyses relevant to implementing this policy.

**Relation to Division Mission:** The purpose of the Laboratory Services Program is to develop and provide timely and accurate physical and chemical water quality data to support the Division's water resource planning and management programs including the Aquatic Plant Management Program and Hydrologic Investigations and Technical Assistance Programs. The provision and use of such data is essential to the employment of science and technology in planning for the maximum reasonable and beneficial use of water resources.

**Program Goal:** To provide analytical laboratory support to all agency programs and activities.

**Program Objectives:** To assist in identifying the need for specific analytical services. To assist in collecting samples to be analyzed. To perform required analyses in an accurate and timely manner. To assist in the interpretation of analytical results.

**Performance Measures:**

Workload Indicators: (FY 1994-95)

1. A total of 843 samples were analyzed, many for multiple parameters, for the Aquatic Plant Management Program, various ground water programs, the Marine Resources Division and other miscellaneous projects.
2. Staff became trained in the identification of zebra mussel larval stages.
3. Staff attended numerous conferences and workshops on analytical laboratory functions and served on the Board of Directors of the S.C. Laboratory Management Society.

Efficiency Measures: (FY 1994-95)

1. An average of 1.4 staff hours per sample was expended for laboratory analyses.

Effectiveness Measures: (FY 1994-95)

1. 97% of all samples analyzed were completed by the requested deadline.

## **HYDROLOGY SECTION**

### **PROGRAM - HYDROLOGIC INVESTIGATIONS AND TECHNICAL ASSISTANCE**

Statutory Authority: Chapter 3 of Title 49 (Sections 49-3-10 thru 49-3-50) outlines the responsibilities of the division in conducting water resource planning, policy and coordination of those policies among other State agencies. Section 49-3-40 authorizes the formulation of a comprehensive water resources policy for the state and the conduct of appropriate studies and analyses relevant to implementing this policy.

**Relation to Division Mission:** These studies provide a basis for the determination of the availability of water and the effects of withdrawal, storage and discharge from streams, lakes and aquifers within the state. Findings of these studies aid in formulating and establishing water resources policy and assist in resolving special problems of water resource use. These studies assist regional, metropolitan and local governments and the private sector in planning for water aspects of their programs.

**Program Goal:** To determine the availability, location, and demand for water in the state, to make this information available and provide technical assistance. To conduct feasibility studies of new and innovative techniques for the development of the state's water resources.

**Program Objectives:** To increase the quality and quantity of hydrologic data and interpretation of these data. To maintain an inventory of the availability of water within the state. To provide data and technical assistance to current and prospective users of water within the state. To develop and promote the use of technology, methods, and procedures that encourage the efficient use of water.

To formulate management alternatives for the state and local government for the conjunctive use of surface and groundwater resources. To develop and implement procedures

to minimize competing and conflicting demands for water within the state. To develop and apply integrated multi-objective simulation models to evaluate alternate management decisions.

**Performance Measures:**

Workload Indicators: (FY 1994-95)

1. Select, locate and measure water levels in wells to define the variation in storage in the shallow system, Black Creek, Middendorf, Floridan and Cape Fear Aquifers.
2. Obtain geophysical data from wells to assist in defining the water bearing and water transmitting characteristics of aquifers in the state.
3. Determine the feasibility of aquifers in the state to store treated surface water.
4. Determine the relationship between rainfall and runoff in the state.
5. Develop a model for determining peak flow flood stages for the state.
6. Provide information and technical assistance to water users of the state.
7. Construct permanent sites suitable for continuous measurement of water levels, climatic and atmospheric parameters that affect the natural resources of the state.
8. Determine the potential of the shallow aquifer system to provide water for lawn irrigation at selected sites in the state.
9. Evaluate the ground water supply potential for the Piedmont Region.
10. Determine the hydrologic effects of water withdrawal on saltwater encroachment on barrier islands of the state.
11. Review environmental permits.
12. Develop or assist in developing techniques to minimize algae blooms in lakes of the state.
13. Maintain streamflow measuring stations to adequately define the runoff from the various regions of the state.
14. Assist local economic development entities and the SC Commerce Department in selection of sites for commercial and industrial development.

Efficiency Measures: (FY 1994-95)

1. 80 wells were selected, 60 were located to periodically measure the water levels in the Black Creek Aquifer of the state: \$52.00 per well
2. 43 wells were continuously monitored to provide the status of the availability of water per aquifer in the state: \$2,600 per well
3. 53,000 feet of geophysical logs were obtained from wells in the state: \$0.58 per foot of log.
4. Two sites were studied in the Grand Strand area to determine the suitability of storage of fresh water in the Black Creek Aquifer: \$85,000 per site.
5. 76 Rainfall/temperature/runoff characteristics were determined for a 10 year, two year and one day period for selected sites in the state: \$99.10 per site.
6. The flooding potential was determined for the Congaree River at Columbia: \$9,415 per site.
7. 290 responses were provided for information and technical assistance: \$32.40 per response.
8. Four wells at a cluster site in Allendale County were completed (3032 total feet) for measurement of water levels in the Black Creek, Middendorf and Cape Fear Aquifers: \$61.00 per foot.
9. 24 wells were constructed and developed for determining the storage and yield of wells in the shallow aquifer system in the Hilton Head area: \$526 per well.
10. A draft of "Geology, Ground Water and Water Supply Wells of Greenville County" was completed, reviewed and prepared for publication: \$28,000 for report.
11. Two reports are at press describing the geohydrology of the area in and near the Savannah



River site: \$15,150 per report.

12. 110 environmental permits were reviewed: \$51.40 per permit.
13. An optimization model was evaluated for use in optimizing reservoir operation within the state: \$7,350 cost per model and evaluation.
14. 1660 records were added to the well inventory file and others were edited or appended: \$9.00 per well record. 21,000 feet of land was surveyed for well site selection: \$0.15 per foot.
15. Assistance was provided in selection of four sites for commercial and or industrial development within the state: \$51.00 per site.
16. Approach selected to flush algae blooms for small lake in Barnwell County: \$941.00 cost per evaluation.
17. 18 streamflow measuring stations were maintained to determine the streamflow characteristics of the state: \$8,000 per streamflow station per year, \$3,000 per lake station per year.

Effectiveness Measures: (FY 1994-95)

1. Sites were selected for measurement of water levels in the Black Creek Aquifer. These wells are scheduled for measurement in November 1995. Wells will be selected for the Middendorf Aquifer in 1996. Water level data will be used to evaluate the present water availability within those aquifers.
2. A report of the ground water availability for the Florence Area was distributed. Public presentations were made at Bennettsville, two at Darlington, one to the City Council of Florence, one each to the cities of Dillon and Marion. The City of Florence has issued a Request for Proposal for water source selection and design of an alternative system for water supply.
3. The prediction of the crest of the January and August floods for the Congaree River near Columbia was within one foot of actual stages. The prediction enabled the DNR to close specific hunting areas during the flood.
4. The analysis of the relationship between precipitation, temperature and runoff has indicated that runoff is highly correlatable. Runoff is greatest in areas where precipitation is highest and temperature lowest. In areas of moderately high precipitation and relatively high temperature runoff is least, indicating that the evaporative processes play a major role in water availability within South Carolina.
5. The observed water levels, rainfall and calculated evaporation values were used to determine the availability of of water within shallow aquifer systems with a minimum impact on environment.

**PROGRAM - STATE WATER PLAN**

Statutory Authority: Chapter 3 of Title 49 (Sections 49-3-10 thru 49-3-50) outlines the responsibilities of the division in conducting water resource planning, policy and coordination of those policies among other State agencies. Section 49-3-40 authorizes the formulation of a comprehensive water resources policy for the state and the conduct of appropriate studies and analyses relevant to implementing this policy.

**Relation to Division Mission:** See comments for previous program.

**Program Goal:** To review and develop methods and policies regarding the management of the state's water resources.

**Program Objectives:** The purpose of this water plan is to establish general policies and procedures to maximize the availability of water and optimize the use of water in the state, both now and in the future. The objectives are (1) to establish goals and policies for effective management of the state's water resources, (2) provide guidelines to optimize the availability of water, and (3) to outline a mechanism to implement the management practices within South



Carolina.

**Performance Measures:**

Workload Indicators: (FY 1994-95)

1. Prepared second draft of the State Water Plan. The plan is under review by water suppliers, power producers, environmental, legal, and academic groups and other interested groups or individuals.
2. Organized and held meetings with different interest groups to encourage comments, suggestions and general review of the State Water Plan. The second draft received three technical reviews, one legal review, one economic review, reviews from 12 managers of water utilities, reviews from seven major hydropower operators, and four reviews from agricultural interests.
3. Clemson University began building an economic model to estimate the value of water to alternative users, residential, commercial and various industrial groups which will provide guidelines to determine who will receive water during periods of water shortage.

Efficiency Measures: (FY 1994-95)

1. Cost of meetings: \$50.00/ hour
2. Cost per review: \$500.00
3. Cost to modify water plan: \$50.00/hour

Effectiveness Measures: (FY 1994-95)

1. The approach used in developing the water plan appears to be effective, as more interest developed during the period and many helpful suggestions were received. The third draft of the plan is scheduled for completion in January 1996.
2. The plan was discussed with the Division's Blue Ribbon Committee. Comments by the Blue Ribbon Committee were very encouraging. The committee recommended an early completion of the third draft and recommended sharing the draft with all user groups for final comment.

**PROGRAM - WATER RESOURCES SYSTEMS ANALYSIS AND MODELING**

Statutory Authority: Chapter 3 of Title 49 (Sections 49-3-10 thru 49-3-50) outlines the responsibilities of the division in conducting water resource planning, policy and coordination of those policies among other State agencies. Section 49-3-40 authorizes the formulation of a comprehensive water resources policy for the state and the conduct of appropriate studies and analyses relevant to implementing this policy.

**Relation to Division Mission:** These studies aid in formulating and establishing comprehensive water resources policy for the state and developing recommendations to assure that the long-range interest of all groups - urban, suburban and rural are provided for. Models incorporate the most up-to-date data and analysis available and digitally portray the effects of existing or proposed withdrawals, storage and discharge from or to lakes, streams and aquifers within the state.

**Program Goal:** To study and simulate water resources systems to evaluate and assist the Division in the development and implementation of management policies.

**Program Objectives:** To formulate management alternatives for local governments for the conjunctive use of surface and groundwater resources. To develop and implement procedures to minimize competing and conflicting demands for water within the state. To develop and apply integrated multi-objective simulation models to predict management decisions.

**Performance Measures:**

Workload Indicators: (FY 1994-95)

1. Develop a computer simulation model to study the impacts of municipal water withdrawals on downstream users in the Pacolet River.
2. Present a groundwater management plan for the Pee Dee Region.

3. Investigate the hydrogeologic, geochemical, and economic feasibility of storing drinking water in aquifers of the South Carolina Coastal Plain to augment daily flows in public supply systems in order to meet peak seasonal water demands.
4. Develop an optimization model for operation of reservoirs within the state.
5. Develop a hydrologic model to predict flooding for streams in the state.

Efficiency Measures: (FY 1994-95)

1. Two Aquifer Storage and Recovery (ASR) sites were set up in Horry County and a one-year long test completed. Geochemical processes controlling the quality of water and the ground water flow were modeled. Approximate cost of preparing and producing four reports and models: \$62,000.
2. A model was purchased and evaluated to optimize reservoir operation in the state: \$7,350 per model.
3. The model to predict flood peaks of the Congaree River at Columbia was completed: \$9,400 cost per model.

Effectiveness Measures: (FY 1994-95)

1. The study demonstrated that ASR projects are applicable in the Coastal Plain of South Carolina. Moreover, it showed that ASR systems could inexpensively augment daily flows in a public supply system and thereby provide for long-term demands. The estimated total unit cost of an ASR system was estimated to be less than one-half of that for expansion of a conventional treatment plant.
2. An optimization model was purchased, evaluated and appears to be an effective tool that can be used on many streams in the state on which reservoirs are located. The model will enable the Department to evaluate the effects of reservoir operation on the availability of water to meet demands and to minimize the negative effects on fish and wildlife within the state.
3. Local governments have requested assistance in developing models and evaluating the operation of their water supply systems to minimize costs and negative effects on the availability of water for other uses.
4. A model was used to predict flood peaks of the Congaree River at Columbia. The peak flows were used to determine the opening and closing dates of hunting in the Congaree Swamp. The model used for flood events of January 1995 predicted the peak stages within one foot of observed stages. The model was also used by the State Emergency Preparedness Division to address local flooding problems.
5. More interest in hydrologic research was generated among faculty and graduate students of Clemson University. The Civil Engineering Department research, which is co-advised by Dr. Badr of WRD staff, shows no significant difference in evaporation losses due to building big reservoirs.

## **OFFICE OF STATE CLIMATOLOGY**

### **PROGRAM - STATE CLIMATE PROGRAM**

**Statutory Authority:** Chapter 25 of Title 49 (Sections 49-25-10 thru 49-25-40) provides for the creation of the State Climatology Office which is to serve as a climatological focal point for state government and its agencies. Chapter 23 of Title 49 (Sections 49-23-10 thru 49-23-100) empowers the DNR to formulate, coordinate, and execute a comprehensive drought response plan.

**Relation to Division Mission:** The State Climate Office's mission is to serve as the climatological focal point in South Carolina. This office serves an integral role in carrying out the division and DNR's mission by compiling, storing, retrieving, and analyzing climatological data for hydrologic studies, and supporting scientific analyses for development of State and local

water management practices. Staff participate in the analysis of precipitation information required to perform water use investigations and to support the development of the State Water Plan. Activities include the provision of specialized climate data needed to model hydrologic systems. These models are used to evaluate the sensitivity of water resources to current and future demands for water in South Carolina. The drought response program directly helps achieve the division's mission through the protection and management of water resources during drought and in providing for the most beneficial and essential uses during times of water shortage.

**Program Goal:** To provide and maintain a comprehensive state climate data and information service.

**Program Objectives:** To serve as the focal point for weather and climate activities within the state. To acquire, quality control and archive climate records. To prepare and publish summaries of climate information and data necessary for monitoring environmental change. To develop and monitor drought indices, disseminate drought information and coordinate local and state responses to drought conditions. To assist state and federal agencies in data acquisition and interpretation before, during and after periods of other severe weather. To conduct applied climatological studies which provide information relating to interannual and seasonal prediction of weather affecting the economy and environment of the state.

**Performance Measures:**

Workload Indicators: (FY 1994-95)

1. 3,143 requests for climate information (average of 60 requests/week).
2. 221 monthly climate records collected; 50 received daily through the National Weather Service (NWS) Wire.
3. Six severe weather investigations conducted which facilitated documentation of severe weather in South Carolina as part of the annual agreement with the NWS to prepare the Storm Data report.
4. 50 weekly weather summaries published and distributed.
5. 205 hours provided to S.C. Emergency Preparedness Division during periods of severe weather (bulk of time dedicated to 1995 Spring drought and Hurricane Gordon). An additional 145 hours expended in hazard mitigation efforts, technical support for training exercises, report preparation for risk analysis.
6. Two publications completed: "General Characteristics of South Carolina's Climate" and "Pan Evaporation in South Carolina."

Efficiency Measures: (FY 1994-95)

1. Cost per request: \$5.25 (includes cost recovery for materials and personnel)
2. Cost of annual processing per DNR weather station: \$86.00 (due to use of wireless communications - includes processing, travel to site, equipment maintenance, postage, copies, digitizing, and quality control). Four new sites added: Bennetts Point, Fort Jackson, Gaston, Bennettsville.
3. Cost per severe weather investigation: \$53.00 (includes travel, photographic processing, personnel, and follow-up telephone calls).
4. Average cost per publication: \$216.00 (printing costs only - "General Characteristics of South Carolina's Climate," 43 pages and "Pan Evaporation in South Carolina," 26 pages).

Effectiveness Measures: (FY 1994-95)

1. Response from users concerning services: The annual user survey was conducted using the list of users who were invoiced for services/data. Major concerns included quality of the data, timeliness, and lack of graphical information. User fees are of some concern to only a handful of users. Comments on services were generally favorable. Provision of data and information to state and county users was enhanced in FY 1994-95 through

- access to National Weather Service Doppler Radar.
- 2. All monthly summary-of-the-day climate data forms from unpublished stations (stations that are not officially recognized by the National Climatic Data Center) were digitized.
- 3. 95 percent of special requests for climate information were satisfied; the five percent not serviced were referred to the Southeast Regional Climate Center, the National Climatic Data Center or to private meteorologists. The majority of the unsatisfied requests were related to expert legal testimony and were handled by private meteorologists. The remainder of the requests were related to radar information.
- 4. 100 percent of reported severe weather events were documented as required by cooperative agreement with the NWS. Related severe weather events that were unofficial were documented in the monthly climate summary.

#### **PROGRAM - SOUTHEAST REGIONAL CLIMATE CENTER**

**Statutory Authority and Relation to Division Mission:** In 1978, the U.S. Congress passed the National Climate Program Act (NCPA). In 1986, South Carolina, following details in this Act, created the Office of State Climatology within the Water Resources Commission (now Division). Section 106 of the NCPA mandated the creation of an intergovernmental climate program to study the climate effects on agricultural production, water resources, energy, and other critical sectors of the economy. The Commission, intent on forming a scientific base for the development and implementation of a state water plan, developed a grant proposal and was awarded the grant that funded the Southeast Regional Climate Center in 1989. This Federal/State Cooperative program serves a primary role in support of the division's mission through specialized services to water managers and by conducting applied research on state and regional water problems. The SERCC maintains a regional database that is used to analyze climatological data for hydrologic investigations, water supply management, and drought mitigation. The Federal program has enhanced the service capabilities and data collection efforts of the State Climatology Office. Sub-regional analysis of the climate impacts on water resources is now routinely performed.

**Program Goal:** To enhance climate services and data consistency for each member state.

**Program Objectives:** To provide a suite of climate products and services including dissemination of climate data and information to the Southeast Region. Member entities include the States of Virginia, North Carolina, South Carolina, Georgia, Alabama, and Florida and Puerto Rico and the U.S. Virgin Islands. To assist users in the interpretation and best use of climate data and information with emphasis on interannual and seasonal predictions. To monitor and assess regional climatic conditions and impacts on natural resources. To obtain, quality control, and maintain appropriate datasets to support climate services and applied studies. To conduct applied climate research in cooperation with the NOAA Global Change Research Program on major regional needs which result in enhanced services.

#### **Performance Measures:**

##### Workload Indicators: (FY 1994-95)

- 1. 5,098 (1,877 invoiced) special requests for climate data and information were processed. They included statistical programming for hourly weather elements, especially the dew point, and wind speed and direction. Datasets were compiled for several users in the academic community related to climate change, heavy precipitation, and wind speed. Some requests involved research and programming that extends the uses of the daily and hourly database.
- 2. The following publications were produced and disseminated:  
Semi-annual reports: AR112894 May 1, 1994 to October 31, 1994; AR053095 November 1, 1994 to April 30, 1995  
Research Papers: None published.

Technical Papers: None published.

Special Reports: Tropical Storm Beryl (August 1994); Hurricane Gordon (November 1994); Allergy Update (May 1995).

3. Products developed from applied climate research:
  - A. Health weather watch/warning system to categorize air mass potential for heat wave.
  - B. A prediction model for first bloom and first harvest for several varieties of peaches across the Southeast.
  - C. Monthly and seasonal statistics for use with the monthly and seasonal long-lead climate outlook.
  - D. A computer program to spatially display crop yield estimates and irrigation needs across Florida and Georgia.

Efficiency Measures: (FY 1994-95)

1. Cost per data request: \$9.45/request  
Total program income from data service fees was \$17,742.95.
2. Cost for satellite-based data acquisition: \$442.00/month
3. Cost for dial-up NEXRAD Doppler Radar images: \$210.00/month.
4. Total research project costs: \$110,230.00 The following projects were funded: A. Integrated decision support system for agriculture in the Southeast (second year) - University of Florida and University of Georgia; B. Development of a phenological model for peach growth in the Southeast (first year) - University of South Carolina, Clemson University, and University of Wisconsin - Milwaukee.

Effectiveness Measures: (FY 1994-95)

1. User requests - Total - 1,877 invoiced of the 5,098 handled. Many of the requests were handled by phone or did not meet criteria for invoicing.
2. 225% increase in invoiced user requests over FY 1993-94 (831 requests invoiced and 1,508 handled). This substantial increase was due primarily to improved accounting procedures, NWS referrals and inauguration of the long-lead climate outlook in January 1995.
3. 91% of requests were completed within 48 hours. Longer response times were due to programming needs; all requests were filled within 7 days.

## **RESOURCE ASSESSMENT AND PLANNING SECTION**

### **PROGRAM - EDISTO RIVER BASIN PROJECT**

**Statutory Authority:** Chapter 3 of Title 49 (Sections 49-3-10 thru 49-3-50) outlines the responsibilities of the Division in conducting water resource planning, policy and coordination of those policies among other State agencies. Section 49-3-40 authorizes the formulation of a comprehensive water resources policy for the state and the conduct of appropriate studies and analyses relevant to implementing this policy.

**Relation to Division Mission:** Managing the State's water resources as an interlinked system is dependent upon the availability of high quality data. The Edisto Project has developed a comprehensive geographic system database for the Edisto River Basin and is developing the same type of database for the Combahee-Coosawhatchie and Santee Basins as funds are available. This type of database allows for the provision of a well crafted technical assistance program to communities to conduct natural resource planning studies. These studies directly support the Division's mission by utilizing science, technology, and public involvement in determining reasonable use of the resource base as it is reflected in local and community-based values. It is through balanced efforts such as this that the Division is able to protect our water resources as part of the public trust, for indeed, it is the public who makes the decisions in this process. The State Water Plan, to be effective at all levels of the state, must eventually be a part

of this process.

**Program Goal:** To provide watershed ecosystem planning, data, services, support and management to the Edisto River Basin.

**Program Objectives:** To examine and develop alternative approaches to environmental regulation and management by basin. To assist communities in comprehensive resource management for basin and corridor planning, thereby reducing conflict among resource users.

**Performance Measures:**

Workload Indicators: (FY 1994-95)

Work performed during the project year is identified by the required deliverables listed below in the Memorandum of Understanding between the (former) Water Resources Commission and NOAA.

Objective 1: Development of a public process to classify and prioritize natural resources and sites by value.

Reports and Products Delivered:

"Summary of 1994-95 Environmental Policy Work: The Edisto River Basin Project," April 1995

All project deliverables were provided in a timely manner and remained within budget constraints.

Efficiency Measures: (FY 1994-95)

1. Financial Reporting Requirements:

First quarter report due 7/30/94; submitted 7/26/94

Second quarter report due 10/30/94; submitted 10/01/94

Third quarter report due 1/31/95; submitted 1/18/95

Fourth quarter report due 4/30/95; submitted 4/17/95

Grant close out report and final quarterly report due 4/30/95; submitted 4/28/95

2. Average full-time staff hours per week allocated in FY 94-95:

Planners - 198.00 hours

3. Average cost per hour (Note: these figures do not include fringe benefits, cost of contracts, rent, overhead, supplies) - \$21.13 average per individual/\$108.96 cumulative

Effectiveness Measures: (FY 1994-95)

1. The most effective measurement of the project's success is the participation by 150 individuals serving on the Edisto Basin Task Force and its various committees in the public policy process designed to meet this objective. This task force will make the final recommendations for the future management of the basin's resources based on local values and the findings of the expert committees. Each expert committee is independently evaluating basin resources related to their assigned areas using Geographic Information Systems technology to refine and visualize their results and recommendations to the Basin Task Force.

**PROGRAM - GEOGRAPHIC INFORMATION SYSTEMS**

**Statutory Authority:** Chapter 3 of Title 49 (Sections 49-3-10 thru 49-3-50) outlines the responsibilities of the division in conducting water resource planning, policy and coordination of those policies among other State agencies. Section 49-3-40 authorizes the formulation of a comprehensive water resources policy for the state and the conduct of appropriate studies and analyses relevant to implementing this policy.

**Relation to Division Mission:** See comments for previous program.

**Program Goal:** To develop a geographic information system (GIS) capable of supporting natural resource management.

**Program Objectives:**

1. Develop a digital spatial data base of soils, wetlands, land use, hydrography, transportation,

and contours at 1:24,000-scale and color infrared digital orthophoto quarter-quadrangles at 1:12,000-scale for the Coastal Plain and/or portions of the Piedmont of the state.

2. Develop a technological infrastructure including hardware, software, networks, and personnel to support WRD and DNR natural resource management projects.
3. To support the Edisto Basin Project (formerly known as the Natural Resources Decision Support System), the Southeast Regional Climate Center, and other projects requiring complex spatial and statistical analyses or GIS hardware, software or network/communications support.
4. To assist DNR and other State agencies in the establishment of standards and procedures for digital data base development and applications that are adopted statewide.
5. To provide desktop graphics and cartographic support to the Division and to the DNR including digitizing, graphic file conversion, digital slide and presentation graphics production, and publications graphics and layout.

**Performance Measures:**

Workload Indicators: (FY 1994-95)

The work performed during the project year is identified by the requirements of two Memorandums of Understanding between the SC DNR/WRD and the National Oceanic and Atmospheric Administration (NOAA) and through operational directives from the Division Deputy Director.

Reports, Products, and Services Delivered:

1. "An overview of digital cartographic data base development and geographic information systems activities of the Natural Resources Decision Support System during fiscal year 1994-95," April 1995.
2. "Fishes of the Edisto River Basin," March 1995.
3. GIS analyses were completed for fifteen expert committees for the Edisto River Basin project involving application of evaluation criteria to resources in the four sub-basins.
4. The GIS infrastructure was expanded to include ten workstations and ARC/INFO GIS licenses. It also was linked to the Internet to provide access to critical spatial natural resources data. Network security software was installed and procedures implemented to prevent vandalism to the WRD system and resources.
5. Data digitization was completed for 70 Digital Line Graphs, 65 soils, and 66 wetlands/land use quadrangles in the Santee basin.
6. Contracts were established for Digital Line Graphs, soils, and wetlands/land use for 159 quadrangles in the Pee Dee and Lower Savannah River Basins.
7. More than 350 graphics were converted from ARC/INFO and other formats into EPS graphics for digital integration into Division publications, slides, or overhead transparencies for presentation at scientific meetings and public forums.
8. More than 147 maps were digitized to support the Southeast Regional Climate Center, River Conservation, and Aquatic Plant Management programs. Many were converted to AUTO-CAD graphics format for various reports.

Efficiency Measures: (FY 1994-95)

1. Financial Reporting Requirements:  
First quarter report due 7/30/94; submitted 7/26/94  
Second quarter report due 10/30/94; submitted 10/14/94  
Third quarter report due 1/31/95; submitted 1/18/95  
Fourth quarter report due 4/30/95; submitted 4/17/95  
Grant close out report due 4/30/95; submitted 4/28/95
2. Average staff hours per week allocated in FY 94-95:  
Full time equivalent (FTE) - 150.00



Full time temporary grant - 75.00

Part-time temporary - 37.50

TOTAL 262.50

3. Average cost per hour (Does not include fringe benefits, equipment maintenance, supplies, rent, or contractual services).

Full time equivalent -

Average per individual - \$17.82, Cumulative \$71.28

Temporary grant -

Average per individual - \$14.62, Cumulative \$29.24

Part-time temporary -

Average per individual - \$10.00, Cumulative \$10.00

Effectiveness Measures: (FY 1994-95)

1. The major portion of the data base development is jointly funded with federal government mapping agencies or is awarded to private sector vendors through a quality-based technical bid evaluation process. This has allowed the WRD to retain minimal staff while obtaining high quality data mapped to National Map Accuracy Standards for 35-50% cost savings.
2. The program received more than twenty requests for digital natural resources data during the year. Digital files were obtained by the Low Country Council of Governments, Dorchester County, the City of North Augusta, South Carolina Electric and Gas Company, numerous architectural and planning firms, and students and faculty at the University of South Carolina. Numerous other inquiries into data availability were made by similar organizations where WRD has not completed data base development.
3. The National Research Council, in their report "Promoting the National Spatial Data Infrastructure through Partnerships," cited this program as one of the best examples in the United States of partnerships between state, federal, local governments and the private sector.

**PROGRAM - RIVER CONSERVATION PROGRAMS**

Statutory Authority: Chapter 29 of Title 49 (Sections 49-29-10 thru 49-29-230) makes the DNR responsible for administration of the South Carolina Scenic Rivers Act. Chapter 3 of Title 49 (Sections 49-3-10 thru 49-3-50) outlines the responsibilities of the Division in conducting water resource planning, policy and coordination of those policies among other State agencies.

**Relation to Agency Mission:** The River Conservation Program directly supports all three components of the Division's mission. Both the Scenic Rivers Program and the River Corridor Planning Program rely upon a balanced interaction between scientific and technical information and public involvement in drafting management plans for rivers. A key goal of the River Corridor Planning Program is the examination of maximum beneficial, reasonable use of riverine resources through community-based planning processes. Local values together with good scientific and technical information provide the basis for this planning program.

The Scenic Rivers Program is a preservation/conservation oriented program and is mandated to protect unique and outstanding resources as a public trust. This is accomplished by coordinating our responsibilities with the appropriate State agencies and riparian landowners in drafting scenic river management plans.

**Program Goal:** To provide task-force oriented planning for river segments; and identification, protection, and management of the state's outstanding and unique rivers.

**Program Objectives:** To assist communities in comprehensive resource management for basin and corridor planning, thereby reducing conflict among resource users. To identify, seek protection for, and manage the state's outstanding and unique rivers through inclusion in the Scenic Rivers Program. To facilitate a greater appreciation and understanding of the state's



critical riverine resources through the conduct of Beach Sweep/River Sweep, American Rivers Month, and public informational publications.

**Performance Measures:**

Workload Indicators: (FY 1994-95)

1. 38 presentations on river conservation were given to public and private interest groups.
2. Scenic Rivers Program staff worked on the Broad, Lower Saluda, Lynches, Little Pee Dee and Reedy Rivers. The Scenic Rivers Advisory Committee was established for the Lynches River.
3. Beach Sweep/River Sweep in 1994 coordinated over 4,500 volunteers.
4. Catawba River Corridor Study - Published the Catawba River Corridor Plan, the final report of the citizens-based management plan for the Catawba River from the Lake Wylie Dam to Highway 9. The study involved over 175 local citizens in the planning process.

Efficiency Measures: (FY 1994-95)

1. Beach Sweep/River Sweep: Staff time: 292 manhours; Cost/hr: \$12.00; Miles of rivers cleaned: 375; Tons of trash removed: 47.5; No. of volunteers coordinated: 4,500
2. Scenic Rivers Program: Staff time: 3,009 manhours; Cost/hr: \$9.25; Number of river miles in designation status: 94; Cost/mile: \$360.00
3. Catawba River Corridor Study: Staff time: 650 manhours; Volunteers coordinated: 180; Number of river miles: 30

Effectiveness Measures: (FY 1994-95)

1. Number of river miles in Scenic River designation: 94 miles
2. 100% of public presentations satisfied (52)
3. 40 events scheduled for American Rivers Month
4. River Sweep events held at 52 sites, involving over 4,500 volunteers and 47.5 tons of trash collected from 375 river miles
5. Established the Lynches River Scenic River Advisory Council involving 25 citizens who will develop a plan to manage the Lynches River.
6. Published and distributed the *Catawba River Corridor Plan*.

## DIVISION OF WILDLIFE AND FRESHWATER FISHERIES

The primary objective of the Wildlife and Freshwater Fisheries Division is to conserve, protect, manage and enhance South Carolina's wildlife, freshwater fisheries, and endangered species, and their habitats, as well as critical habitats and unique ecosystems for the public benefit of present and future generations, and to ensure the continuation of hunting and fishing opportunities for the citizens of the State. The objectives are accomplished by conducting mission-oriented research, acquisition and management programs, and provision of technical assistance to private landowners.

### FRESHWATER FISHERIES SECTION

The Freshwater Fisheries Section is organized, equipped and staffed to provide the sportsmen and citizens of South Carolina with those services required to protect, conserve, and enhance the state's freshwater fishery resources.

The Fisheries Section's organizational structure includes eight fishery districts that provide local attention to every county in the state. Operations incorporate six fish hatcheries that are used to produce and stock those species necessary to replenish and enhance natural fish populations. Additionally the agency provides fifteen public fishing impoundments across the state totaling 1,385 acres water.

#### DISTRICT OPERATIONS

Survey and inventory activities were conducted to assess the status of fish populations in the State's major rivers and reservoirs. An evaluation of the genetic status of South Carolina's eastern brook trout population was completed. In cooperation with the Law Enforcement and Boating Division, section personnel initiated trout stocking of the Lower Saluda River by helicopter. The minimum size limit for striped bass in the Santee-Cooper system was increased to 21 inches. An annotated bibliography of redear sunfish life history information was developed. A smallmouth bass habitat assessment was completed for the Lower Saluda River.

Maintenance of the state-wide fish concentration area program continued. The fisherman mooring area program on Lake Murray was expanded with the installation of ten new mooring devices on two bridges at the lake. A fisherman access trail was developed at Mountain Lakes Public Fishing Area and at two sub-impoundments of Lake Russell. A fishing trail was 50% completed at Star Fort Pond.

Technical assistance was provided to pond owners, environmental permits were reviewed, and fish kills were investigated. Details of these activities are summarized in Table 1.

**Table 1. Technical assistance activities carried out by Freshwater Fisheries Districts**

Project	Pond Consultations	Permits Reviewed	Fish Kills Investigated
Fishery District I	341	21	50
Fishery District II	85	2	7
Fishery District III	42	16	4
Fishery District IV	356	18	4
Fishery District V	480	2	21
Fishery District VI	371	21	6
Fishery District VII	137	18	0
Fishery District VIII	374	15	0

#### FISH HATCHERIES

### Sterile Grass Carp Program

During FY95 171,000 sterile grass carp were shipped into South Carolina for stocking in public and private waters. Ploidy was tested on 2,890 individuals with no diploid grass carp being detected.

### Fish Hatchery Operations and Production

The Department's six freshwater hatcheries produced a total of 11,276,670 fish during FY95. Of this total production 1,895,704 striped bass were "grown out" at the Orangeburg National Fish Hatchery from fry produced at the Department's Bayless Fish Hatchery. Hybrid and striped bass stocking records are presented in Table 2.

Table 2. Striped bass and hybrid stocking records for FY95.

Stocking Location	Species	Number Stocked
Lake Thurmond	Hybrid (original)	444,113
Lake Hartwell	Hybrid (original)	326,394
Lake Greenwood	Striped Bass	305,387
Lake Moultrie	Striped Bass	2,486,092
Lake Murray	Striped Bass	1,393,635
Santee River	Striped Bass	333,321
Cooper River	Striped Bass	314,846
Pee Dee River	Striped Bass	11,712

Two 50'X8' concrete raceways were constructed at Campbell Hatchery for catfish production. A heated fish holding tank was constructed at Barnwell Hatchery to provide space to "over-winter" *Tilapia spp.* New steps and walk ways were to allow better access to rearing pond catch basins were constructed at the Spring Stevens Hatchery.

### **STATE LAKES MAINTENANCE**

The Freshwater Fisheries Section manages and maintains fifteen public fishing lakes. Maintenance of these facilities includes construction and repair of support facilities, boating access, aquatic weed control, lake fertilization, and maintenance of grounds and signage.

Major repairs were completed at Dargon's Pond necessitated by heavy flooding during the winter of 1994. A picnic shelter, boat ramp, and handicapped accessible fishing pier were constructed at Jonesville Reservoir. Construction of a picnic shelter at Lake Ashwood and a boat ramp at Mountain Lakes was also completed.

### **REDIVERSION PROJECT**

The Rediversion Project is funded by the U. S. Army Corp of Engineers. The efforts of the project are directed toward mitigating the impacts of the Cooper River Rediversion Project on anadromous fish populations in the Santee-Cooper system.

Approximately 1,071,000 fish were passed at the St. Stephen's fish lift and an additional 138,000 pounds of fish (461,000 herring units) were passed in to the system at the Pinopolis lock. During the fish lift season the St. Stephen's facility was toured by over 3,500 visitors. Agency personnel continued to work with USACOE staff to complete a \$5.8 million modification to improve lift efficiency and effectiveness. Work was initiated to evaluate the shortnose sturgeon population that utilizes the rediversion canal and fish lift.

### **WATEREE-CONGAREE RESEARCH STATION - EASTOVER**

Genetic evaluations of largemouth bass documented the occurrence of Florida subspecies alleles in South Carolina largemouth bass populations. The frequency of occurrence of Florida alleles tends to increase as one moves from the southeast region to the northwest region of the state. Genetic evaluation of coastal river striped bass suggested that locally adapted populations may exist in these habitats. Addition information and analysis is needed to determine if these

suggested differences are real and significant.

Efforts were continued to develop an individual-based model for striped bass of the Santee-Cooper system. The model has reached the state of development where reasonable simulations of the population dynamics can be made.

## **ENVIRONMENTAL**

### **Habitat Conservation Coordination**

Meaningful habitat conservation can be accomplished through thorough and consistent evaluation of development activities. Those activities having a potential impact on fish and wildlife resources include wetland disturbance, water quality degradation, shoreline development, stream and reservoir dredging, water withdrawals, diversions, and impounding streams. To be effective in this endeavor requires a combination of field evaluations, desktop reviews, inter- and intra-agency coordination, policy development and review of regulations and legislation. Action was taken on the following items to accomplish our objectives.

(1) Review of Environmental Permits: Statewide coordination of environmental permits for the Wildlife and Freshwater Fisheries Division was provided by the Environmental Section. In fiscal year 94-95 reviews of 718 permit applications were conducted, 341 of which were investigated and had comments issued. More emphasis was placed on reporting and resolving wetland violations than previously due to more enforcement action by the US Army Corps of Engineers (USACE). In general, actions centered around wetland disturbances, instream flow alterations, point source discharges and non-point source impacts.

(2) Review of Environmental Legislation and Regulations: Significant environmental legislation and regulations were reviewed and constructive comments were made as necessary to promote fish and wildlife habitat protection. Items on which action was taken include 1) proposed changes in wetlands delineations manual used for Section 404 of the Clean Water Act, 2) legislation to better define the limits of Section 401 of the Clean Water Act in hydropower licenses, 3) revisions to the Clean Water Act Section 404 (b)1 mining guidelines, 4) regulations for non-point source pollution associated with silviculture practices including review of the Best Management Practices manual and the Section 6217 "management measures" of the Coastal Zone Act Reauthorization, 5) state and federal guidelines for construction of docks and bulkheads in wetlands, streams and reservoirs.

(4) Inter-Agency Coordination: Fish and wildlife habitat needs were represented at seminars, public meetings, and regulatory proceedings which may significantly affect the resource. Efforts were coordinated with state and federal agencies including SC Department of Health and Environmental Control, US Fish and Wildlife Service, US Environmental Protection Agency, USACE, Sea Grant Consortium, National Marine Fisheries Service, National Resource Conservation Service (formerly Soil Conservation Service), and Georgia Department of Natural Resources. An example of our coordination efforts is the revisions made to the USACE Standard Operating Procedures for Wetland Mitigation (SOP). Personnel from the USACE, US Fish and Wildlife Service and the Environmental Section worked together to develop a draft revision of the 1993 SOP. This new version should provide significant improvements in the process of compensatory mitigation for wetland impacts and, therefore, improve protection of fish and wildlife habitat statewide.

As of July 1, 1994 state government restructuring combined the SC Wildlife and Marine Resources Department with the SC Water Resources Commission, SC Land Resources Conservation Commission and SC Geologic and Geodetic Survey to form the new SC Department of Natural Resources. Environmental Section staff were members of the Environmental Programs and the Science and Technology transition committees. Considerable time and effort was made assessing information, technology, and staffing needs for the new department and developing transition plans. Environmental Section staff met with representatives of the other newly formed Divisions weekly to discuss environmental permits, issues and policies.

(5) Development of Policy: The Environmental Section continued to work on departmental policies for wetlands impacts, alterations and mitigation, and instream dredging and mining. Staff assisted the Marine Resources Division in developing a manual titled "Guidelines For Evaluating Proposed Habitat Alterations". This manual is designed to 1) aid the general public in developing plans that are compatible with the environment, 2) assist the SCDNR in making consistent evaluations on similar permit applications, and 3) encourage better fish and wildlife management and prudent use of the State's natural resources.

Environmental Section staff also participated in the development of a SCDNR policy for wetland mitigation banking. Staff also reviewed and made comments to a proposed State Water Plan which is being developed by the Water Resources Division. To date, these plans are in draft form.

#### **Index of Biotic Integrity Studies**

The purpose of these surveys was to compare fish communities of streams receiving perceived impacts from gold mine operations with other streams in the lower Piedmont ecoregion in South Carolina. Eighteen stream surveys were conducted. Fish communities were sampled with backpack electrofishing gear. Water quality and habitat variables were noted with each survey. Forty-three species of fish were captured. Data from surveys were analyzed using an index of biotic integrity. Streams receiving point and non-point discharges from gold mine operations rated consistently lower than other streams in the survey. This information has been used in conjunction with environmental permit reviews. A draft report was completed in 1995.

A second study was initiated in Fall 1994. This study compares fish communities of Sandhills streams with and without perceived impacts. Sampling was completed in Spring 1995. The results of this study will also be used in conjunction with environmental permit reviews.

#### **Hydropower Coordination**

The Federal Energy Regulatory Commission (FERC) licenses approximately 40 hydroelectric projects throughout the state, while the USACE operates four large hydroelectric projects. The Environmental Section has used its role in the FERC licensing process to make recommendations for license provisions needed to protect, enhance, or mitigate damages to fish and wildlife associated with operation of these projects. Recommendations were also made for recreational access and facilities needed at these projects. For USACE projects, the Section was actively involved in studies addressing fish entrainment, instream flow, lake level regulation, and water quality.

A biologist coordinated the Section's involvement with hydroelectric projects. He assisted with and approved study designs, inspected field activities, interpreted study results, and made recommendations to applicants, the FERC, or the USACE based on these studies. Input was solicited from Freshwater Fisheries, Wildlife Diversity and Wildlife Management Section biologists. Field work was mainly conducted by project operators or their consultants. The results of our efforts follow.

(1) Routine FERC Projects: Work was conducted on 24 hydros in FY 94-95. Draft environmental assessments issued by the FERC were reviewed and SCDNR comments were submitted for Saluda, Hollidays Bridge, and Buzzards Roost hydros on the Saluda River; Neal Shoals, Ninety-Nine Islands, and Gaston Shoals hydros on the Broad River; and Stevens Creek hydro on the Savannah. These documents represent the FERC's preliminary decisions for terms and conditions of new licenses. Significant accomplishments on these projects include final agreement among the FERC, the applicant and the SCDNR for: (1) improved recreational facilities including 7 new or improved boat launching facilities at 5 projects, 8 new barrier-free fishing facilities at 6 projects, 6 new parking areas at 4 projects and 6 new bank angler trails at 5 projects; (2) a minimum flow (400 cfs) and a low-flow contingency plan (300 and 225 cfs) for the Buzzards

Roost hydro, affecting 15 miles of the Saluda River below the project. This represents substantial habitat improvement over historical low flows (40 cfs from dam leakage); (3) minimum flows below the Gaston Shoals, Ninety-Nine Islands and Saluda hydros. These agreements protect aquatic resources in about 30 miles of the Broad and Saluda rivers, especially during periods of low flow; (4) calculating the number of fish killed by turbine operation and corresponding mitigation at 5 hydros; and (5) oxygenation of discharges from the Buzzards Roost hydro to assure dissolved oxygen concentrations are adequate for fisheries resources throughout the year.

Agreement was reached between Consolidated Hydro, Southeast and the SCDNR for a 140 cfs minimum flow in the section of the Saluda River bypassed by the Lower Pelzer hydro.

Modeling and a draft report for the IFIM flow study at the Lockhart Hydro were completed. Results indicated flows between 180 cfs (the applicant's analysis) and 300 cfs (the Section's analysis) would be suitable for fisheries enhancement in two miles of the Broad River dewatered by the project. Either of these flows would represent a substantial improvement in fisheries habitat for this reach which has historically received only leakage flow (35 cfs) from the dam during most of the year. Other ongoing work at the Lockhart hydro include fish entrainment and recreation studies.

(2) Lake Murray Dam: Work continued with South Carolina Electric and Gas Company (SCE&G) to identify operational changes required to protect fishery resources by improving instream flow, water quality and reducing fish entrainment. (1) SCE&G continued its "last on/first off" operation rule for Unit 5 to reduce fish entrainment during the late summer. (2) SCE&G continued to monitor fish densities in the vicinity of Unit 5 with hydroacoustic equipment and to avoid operation when high densities of fish occurred near the intake. (3) SCE&G began monitoring fisheries habitat quality in the lower lake in June 1995 as previously conducted by the Freshwater Fisheries Section. (4) After several years of meetings and correspondence, SCE&G agreed in June 1995 to use turbine venting technology in an attempt to improve oxygen concentration in its discharges. This could result in up to 3 mg/l dissolved oxygen increases in the Saluda River below the hydro. If successful when tested in 1996, it would represent substantial habitat improvement for this coldwater fishery.

The shoreline management plan for Lake Murray was completed in cooperation with SCE&G. Using GIS mapping, the shoreline was categorized into residential, undeveloped, recreational, and industrial areas. Identification of environmentally sensitive areas was a key component of the plan. The plan will be a useful tool in assessing impacts of proposed development to fish and wildlife habitat.

(3) Bad Creek Entrainment: Environmental risk modeling using RAMAS was completed by Duke Power staff in coordination with Section staff. Results indicated that entrainment of threadfin shad under normal operating conditions increased the probability of population crashes. Additional assessments for threadfin shad and blueback herring are ongoing.

(4) Assess Russell Dam Entrainment and Water Quality: We continued our participation in a court-approved study being conducted by the USACE to evaluate fish entrainment and mortality associated with the operation of four, new reversible turbines. Phase II fish entrainment sampling was not completed during this program segment as planned due to the USACE's inability to meet agreed to statistical criteria for sampling. High entrainment during the 1995 spring exacerbated sampling problems. Preliminary estimates indicated more than 2 million fish were entrained during pump and generation tests of this program segment. Spring 1995 entrainment rates for blueback herring, hybrid bass and striped bass were substantially higher than those of Spring 1994. Final estimates for this period are due by November 1, 1995. Spring 1995 tests indicated new bar screens with smaller spacings and modifications to the high-frequency-sound "fish spooker" system were not effective in reducing entrainment to acceptable levels.

## **WILDLIFE DIVERSITY SECTION**

### **PROGRAM: WILDLIFE DIVERSITY**

**Program Goal:** Maintain all of South Carolina's native plants and animals in their natural habitats and preserve the archaeological record on the land.

#### **Program Objectives:**

- Service requests for data on endangered species and critical ecosystems, and make technical consultations as required.
- Dedicate at least five new Heritage Preserves and additions.
- Carry out research, survey, and management projects on at least 20 high-priority species and ecosystems.
- Resolve wildlife assistance calls as required.
- Maintain habitats and facilities as required on the system of Heritage Preserves, including 15 high-priority projects.

#### **Performance Measures:**

##### Workload Indicators:

Serviced over 300 requests for data on endangered species and over 900 environmental permits.

Made 132 technical consultations and presentations

49 individual research, survey, and management projects were in progress during the year.  
3,975 wildlife assistance calls were resolved.

11 habitat management and facilities improvement projects carried out on Heritage Preserves.

Nearly 400 inquiries pertaining to taking and/or possession of nongame wildlife permits were handled; resulting in 86 permits of various types being issued.

##### Efficiency Measures:

Land acquisition costs averaged \$641 per acre.

Cost per wildlife assistance call: \$17.00

Average cost of research, survey, or management projects: \$11,657 per project.

##### Effectiveness Measures:

1995: 21,143 contributions to Check for Wildlife received, averaging \$7.50 per contribution.

1994: 22,017 contributions, \$8.06 per contribution

1995: rare habitat elements and archaeological sites were protected on 8 new preserves or additions.

1994: 75 elements were protected on 9 preserves.

1995: Delivered 12 major technical papers and reports. 1994: 17 technical papers & reports

### **1994-95 Annual Report Highlights**

1. Two breeding species of songbirds new to South Carolina were documented, the Willow Flycatcher in Spartanburg County, and the Warbling Vireo at Santee National Wildlife Refuge in Clarendon County. The birds were recorded as part of an ongoing project known as the Breeding Bird Atlas, in which volunteers are systematically documenting the status of all the state's breeding birds.

2. Building on management successes in South Carolina and other states, the bald eagle was downlisted nationwide from Endangered to Threatened status. This has been one of the most conspicuous examples of the effectiveness of the Endangered Species Act. In South Carolina, a total of 149 eaglets were produced from 102 occupied territories. The recovery goal in South Carolina was to attain 100 occupied territories; hence, the conclusion that the species is recovered here. Monitoring activities and technical guidance to landowners will continue to assure against future downturns.

3. The first of a planned series of annual dolphin counts was held, coordinated jointly by SC



DNR and Coastal Carolina University. Relying on volunteer surveyors, the count was part of a region-wide survey carried out simultaneously from New Jersey to Georgia. Over 200 persons participated in the South Carolina count and counted 309 dolphins. The counts will give us an indicated of annual trends.

4. The Heritage database now contains records on about 6,000 occurrences of endangered species and other significant natural elements such as wading bird rookeries and special natural communities. For the first time, we are able to produce custom-made maps for a variety of users. Mapping projects for the year included the Mountain Bridge Wilderness Area, significant natural areas on Fort Jackson, areas of interest to the Congaree Land Trust, potential wetlands mitigation bank assessment areas, reptile and amphibian study capture sites. In all, over 300 requests for data on endangered species were processed.

5. As the public debate on reauthorizing the Endangered Species Act waxed and waned through the year, one endangered species, the Red-cockaded Woodpecker, received a great deal of attention from the press as well as our Section's biologists. Working with the SC Forestry Commission staff, we have been excavating artificial nest cavities and testing methods for translocating woodpeckers from threatened sites. The work has been rewarded with a 28% increase in active woodpecker clusters on the Forest since 1992. Fledging of young woodpeckers increased by 20% over the previous year. We also provided guidance to a number of landowners and foresters involved with timber sales that could have affected Red-cockaded Woodpeckers.

We also participated extensively in the Red-cockaded Woodpecker Coalition, a group of representatives from government, nonprofit organizations and industry, searching for long term solutions to conflicts involved woodpecker management on private lands. Several promising approaches are under consideration, including a "safe harbor" proposal which would hold landowners harmless from prosecution under the ESA for management actions which increase the number of woodpeckers on their land. A number of landowner incentives, each requiring a certain degree of new funding, are also under study.

6. One Heritage Preserve, Bird Key-Stono, was completely washed away due to shifts in currents and changing erosion and deposition patterns of the sand which had nourished the island for over 25 years. Bird Key had been the site of the largest Eastern Brown Pelican rookery within this species' range. Other major species which had nested on the island were Royal Tern, Sandwich Tern, and Laughing Gull. These species suffered an average decrease in total nesting for the year of 37%, suggesting that loss of the Bird Key habitat is in great part responsible for recent sea and shore bird nesting declines in South Carolina.

7. The Least Tern, a state-listed species of concern, was the subject of much study this summer. Long-term census information indicates that the state's Least Tern population is stable or increasing, but there is still cause for much concern. Seventy-one percent of nests were located in only five colonies, making the nesting effort susceptible to human-caused disturbance. Colony sites also exhibited a high turnover rate and there was also a dramatic shift in nesting habitat from natural to artificial sites. In 1989, only 14% of Least Tern nesting was on roofs, whereas in 1995, 61% of nests were located on roofs. This trend is particularly alarming because roofing companies are now using a variety of rubber and vinyl materials instead of pea gravel. Hence, as the birds seek alternative nest sites to escape human disturbance, the available roof habitat is also decreasing. We cannot help but wonder what would have happened to Least Terns had they not adapted so quickly to using roof nesting sites.

8. A Wildlife Diversity field office was established at the Webb Wildlife Center, a DNR Wildlife Management Area in Hampton County. The opening coincides with a major addition to the Webb Center known as the Palachucola tract, which brings the total acreage at the Center to 12,623. Having renovated an old building for laboratory space, Technician Wade Kalinowsky is now hard at work doing reptile and amphibian surveys at a number of sites in the low country, including



the Webb Center, Tillman Sandridge Heritage Preserve, Hoover Plantation, and scattered roadside areas. Wade's data should greatly enhance our understanding of the distribution and status of several reptile and amphibian species known from very few collections in South Carolina.

9. Fort Jackson has benefitted from several concurrent studies by our staff over the years, including a breeding bird study, an extensive survey of longleaf pine vegetation, and a survey for bat species of concern. Taken together, these projects point to the fort as being an extremely significant managed area, despite its primary mission as a military training area. Several high-quality examples of xeric (dry) longleaf pine communities have been found, mainly in areas receiving heavy bombardment from artillery shells! The bat surveys are benefitting from a bit of high technology in the form of computer signal processors which can provide a visual display of bat calls to aide in their identification, and recording equipment capable of capturing and playing back bat calls. One of the major finds has been two new roost sites for the Rafinesquii's Big-Eared Bat, a state species of concern.

## **WILDLIFE MANAGEMENT SECTION**

The primary objective of the Wildlife Management Section is to provide the best possible hunting opportunities for the sportsmen of South Carolina while ensuring the well being of all wildlife species. This objective is accomplished by providing technical assistance to landowners, conducting mission-oriented research and most importantly, operating a wildlife management area (WMA) program open for public hunting. During FY 1994-95, 1,330,736 acres of land were open to the public for hunting, and a total of 56,869 WMA permits were sold. Harvests of 54,944 deer and 11,692 turkey were recorded at department check stations. Turkey tags were issued to 33,076 hunters during the 1995 spring turkey season. Forty-seven public dove fields (1965 acres) were available across the state. 1725 hunters participated in 76 public waterfowl hunts with a reported harvest of 2,568 ducks. An 8-day Canada goose season was held with 2,920 permits issued and 1554 geese harvested. The efficiency of the WMA program is reflected in the cost accrued to provide public hunting land. Payment to landowners to lease hunting land during 1994 was \$2.19/acre for corporate land and \$0.38/acre for Forest Service land. The average cost per acre to lease public dove fields was \$0.92/acre.

The Wildlife Management Section's public relations activities are important in informing the public of management programs. Section staff made 377 public presentations before audiences of over 17,010, prepared over 63 news releases, and developed technical management plans for over 609 landowners.

The state is divided into six wildlife regions with a regional biologist responsible for all wildlife management activities within a region. Statewide project supervisors for major wildlife groups coordinate data collection, research, and surveys including deer, turkey, waterfowl, small game, furbearers, and alligator. Supervision is accomplished by periodic inspections of the various projects, office conferences and reviewing reports and management plans. The actual performance of each project is tracked through department accounting records.

The following is a summary of the various wildlife management area and statewide projects throughout the state.

### **Wildlife Region I (Anderson, Greenville, Oconee and Pickens Counties)**

A total of 213,000 acres of land were available for outdoor recreation during 1994-95. Deer hunters reported harvesting 3,704 deer (2682 bucks and 1022 does), an increase of 116 percent over the previous season. Turkey hunters harvested 849 birds, an increase of 96.5 percent. Sportsmen harvested seven bear, an increase of 250 percent. A bear research project was completed, with 12 bear trapped and tagged during the fiscal year. Three waterfowl areas were managed. Technicians planted nine public dove fields in the region including two adult/child fields. Staff sampled five of these fields on opening day. Four-hundred and thirty-three hunters

shot 16,906 shells and harvested 1,117 doves on these fields.

Technicians planted 451.5 acres of annual and perennial vegetation and mowed 295 acres to enhance wildlife species. Biologist measured 143 deer antlers, with 53 typical and one nontypical rack meeting minimum qualifications for the state record books. The new S.C. record state typical deer came from Region I. Four hundred and eighty-nine hunters harvested 405 geese in the region. Biologist relocated 531 geese and banded 435. Technicians monitored 175 wood duck boxes with 120 used producing 986 ducklings. Presentations were made to 56 groups consisting of 4,474 people. Personnel conducted surveys to monitor furbearer, goose, bear, deer, quail and dove populations. Hard and soft mast surveys were also conducted. Biologists gave technical assistance to 160 private landowners and spent five days working with 16 forest stewardship plans. One-hundred and forty-three nuisance wildlife complaints were handled. Regional personnel cooperated with Clemson University, U.S. Fish and Wildlife Service, U.S. Forest Service, S.C. Forestry Commission, Duke Power Company, Crescent Resources, Ducks Unlimited, National Wild Turkey Federation, Greer Department of Public Works, local Legislative Delegations and S.C. Parks Recreation and Tourism to promote and protect wildlife conservation.

**Wildlife Region II** (Abbeville, Aiken, Edgefield, Greenwood, McCormick, Saluda Lexington, Richland and Calhoun Counties)

Deer hunters using the 235,000 acres of public hunting lands on the Western Piedmont Hunt Unit checked 19,733 deer, a 15.7 percent decline from the previous year. This equates to a harvest of 11.7 deer per square mile of habitat. The number of females in the harvest declined slightly to 41.9 percent. The drop in the deer harvest is thought to be the result of an abundant acorn crop and relatively poor hunting season weather, rather than a reflection of an actual drop in deer numbers. Wild turkey harvest during the Spring of 1995 was 1,846 birds, a 25 percent increase from the previous spring. The fourth Canada goose season was conducted during an 8-day experimental season. Reported harvest was 481 geese taken by 622 hunters.

The Crackerneck WMA in Aiken County provided recreation for over 1,535 hunters and fishermen with 85 deer, 22 wild turkeys, 45 feral hogs, 86 ducks and a variety of small game and fish being harvested. The project biologist spent 38 days in conducting the hunts on Crackerneck.

Wildlife habitat in the Region was improved by planting 642 acres of various wildlife food plants. An additional 293 acres were improved by mowing, 103 acres treated with herbicide, and 410 acres were control burned. Ten thousand bicolor lespedeza seedlings and 135 oak trees were planted. Two and ½ miles of access road were improved by spreading gravel and 2.2 miles were graded. Seven public dove fields were provided. Canada goose nest tubs were checked and repaired where needed for the resident goose flock on Lake Thurmond, which now numbers at least 3,500. As part of the Atlantic Flyway resident-migrant goose study, 482 geese were banded and 111 previously banded birds retrapped. Fifty seven new wood duck nest boxes were erected and 232 were checked for utilization. Forty five nest box applications were checked. Three hundred eighty four miles of WMA boundary were checked and posted with 2,907 signs. Another active eagle nest was confirmed in McCormick County, making 3 nests in the Region.

On Crackerneck WMA, 26 acres of annuals were planted, 20 linear quail plots were planted with perennials, 15 miles of road were mowed, 6 miles of roads were seeded to clover and 12 miles of roads were fertilized. Four new wood duck nest boxes were erected and 23 boxes were checked. Nine wood ducks were banded and four previously banded birds recaptured.

Management of the Department owned Mason Property in McCormick County involved re-writing the management plan for the area to include recommended timber harvest and road construction information. Consultations were held with the NRCS concerning erosion problems on the gas pipeline right-of-way.

Other activities included providing technical guidance to 8 landowners and harvest analysis and recommendations to 4 deer hunt clubs. Deer antlers were measured for their trophy value in

New Ellenton, Barnwell, and at the Sportsmens' Classic. Seventeen presentations were made to 600 people at hunt clubs, civic groups and schools. Over 300 people were contacted as project personnel manned the Wildlife Management Section display during Saluda County's Farm/City week. Nine 4-H Club FACE plots in Abbeville and Greenwood and 10 in Aiken County were judged, with Aiken County kids providing regional winners in 2 age categories.

Censuses and surveys were conducted for mourning dove, quail, furbearers, Canada geese, turkey reproduction, bald eagles and waterfowl. Three U.S. Forest Service Analysis Area prescriptions were reviewed from 2 Ranger districts and comments provided when needed to protect wildlife resources. Active participation in the Forest Stewardship Program involved reviewing 4 plans, 9 site visits, 5 needs checks, 1 completion check and 3 SIP committee meetings.

The Project biologist in Aiken County conducted doe quota investigations on 136 tracts, collected and evaluated harvest data from 1,335 deer and made management recommendations on 48 hunt clubs. As a member of the SRS Site Use Committee, 65 land use proposals and 10 Forest Service compartment prescriptions were reviewed for their effect on wildlife populations. Numerous meetings and correspondence resulted in DOE acceptance of a proposal to add about 6,300 acres to Crackerneck WMA. Ten depredation permits were issued on the SRS, and 7 in Aiken County for beaver, raccoon, coyote and other species. Management advice was provided to 7 landowners. Thirty one wild turkeys were trapped on the Savannah River Site and released on several state restoration areas. On the Crackerneck WMA, 24 acres of annuals were planted in wildlife openings and 4 acres of millet, bahia grass and Kobe lespedeza were planted on several miles of firebreaks and roadsides. Ten bicolor patches were planted in woodlands. A fisheries balance check was made on Skinface Pond and management plans formulated. Sixteen acres of millet were planted at the Head of the Creek WMA dove field in Lexington County. Sixty eight miles of WMA boundary in Aiken and Lexington Counties were posted with 590 signs. Forest Stewardship activities in Aiken County included 2 committee meetings, worksheet preparation and correspondence.

Biologists from the Columbia office made management recommendations on private lands and conducted doe quota investigations in Richland, Lexington and Calhoun Counties.

**Wildlife Region III** (Cherokee, Chester, Chesterfield, Fairfield, Kershaw, Lancaster, Laurens, Newberry, Spartanburg, Union and York Counties).

During 1994-95, 436,258 acres of Wildlife Management Area (WMA) lands were available for public recreation within the region. Big game check stations were provided at 137 sites to allow careful monitoring of big game harvests essential for maintaining healthy wildlife populations. The varied wildlife resources and associated recreational opportunities create significant interest and enjoyment among both residents and visitors.

The region's most popular wildlife related activity was hunting for white-tailed deer. Twenty days of archery hunts, 8 days of primitive weapon hunts, 60 days of still gun hunts and 18 days of either-sex deer hunts were available within the Central Piedmont. This year 29,812 deer (18,016 bucks, 11,796 does) were reported harvested representing a 1.8% increase from the 1993-94 harvest. Forty percent of the 1994-95 harvest was does.

Spring turkey hunting was available for 27 days from April 1 - May 2 and 4,352 turkeys were reported harvested. This year's spring turkey harvest was a 22 percent increase from the previous year's harvest. Turkey hunters were issued 8,591 sets of turkey tags.

Seven public waterfowl hunts were held at the Broad River Waterfowl Management Area and seven hunts were held at the Enoree River Waterfowl Management Area with a total of 120 hunters being accommodated. Opportunity to participate in these hunts was available through application and computer drawing. The combined hunter success for both areas was 1.49 ducks per hunter. This year, twelve species of waterfowl were harvested on these waterfowl management areas with pintail, green-winged teal, black duck, ringnecked, American wigeon, mallard and

wood duck being the most abundant species. Waterfowl hunting was also available at the Duncan Creek, Tyger River and Woods Ferry Waterfowl Management Areas on Wednesday and Saturday mornings during the waterfowl season.

Participation in the region's public dove field program was significant with 18 fields available for public hunting within the Central Piedmont Region. During the 1994 opening day hunts, 803 hunters fired 18,818 shots (23 shots per hunter) and harvested 1,907 doves (9.9 shots per bird).

Small game hunting for species such as rabbit, squirrel, dove, bobwhite quail, woodcock, raccoon, bobcat and fox remained stable and was good throughout most of the region where suitable habitat was available. Many sportsman enjoy the recreational opportunities afforded by small game populations.

At the Department owned or managed properties, public dove fields were prepared and wildlife openings and firelines were maintained. These areas include the Crossroads and Mcbee Tracts in Chesterfield County, the Gray Court Tract in Laurens County and the McConnells Tract in York County.

Canada goose trapping, banding and relocation was conducted at various sites within the region during the year. Nuisance geese were trapped from private areas in Chester, Kershaw, Lancaster, Lexington, Richland, Spartanburg, Union, and York counties. The total trapping effort included 493 geese trapped (415 adults, 78 goslings), 426 banded and 67 which had been previously banded. Sixty-three collar sightings have currently been reported. Future reports of numbered neck collared birds along with other banding data will be used to determine movement patterns, survival rates, population estimates and harvest recommendations.

Habitat for small game species was enhanced at a number of sites. A quail management demonstration area was maintained on WMA property owned by Champion International Corporation in Newberry County. At this area, 50 acres of linear food strips and other plantings were established for quail in cooperation with the Newberry Chapter of Quail Unlimited. Twenty acres of Duke Power Company rights-of-way located on WMA property within the region were planted in linear wildlife food strips. Two turkey demonstration areas were developed on WMA property own by Bowater Incorporated in Union County(503 acres) and in Chester County(1390 acres).

The Sand Hills State Forest in Chesterfield and Darlington counties was provided technical assistance in further developing wildlife habitat. Quail and furbearer surveys were conducted and a public dove field was prepared. Nine big game check stations were maintained for collecting biological data. Harvest data at this area is needed to monitor the health and quality of wildlife populations and to provide guidance for future harvest recommendations.

Wildlife mortality at the Kennecott Ridgeway Mining Company facility near Ridgeway was carefully monitored through direct observation and counts of wildlife using the area. Wildlife observations averaged 4,767 per month and 33 mortality cases were documented this year. Goldmine and wildlife personnel are continuing to evaluate a variety of alternatives in an attempt to eliminate or reduce this mortality. A wildlife habitat development plan has been prepared for goldmine project lands adjacent to the mining facilities and efforts continued this year with the maintenance of wildlife openings and the annual preparation of a public dove field.

Public requests for information and technical assistance required 18 verbal management recommendations and 16 written management plans involving a variety of wildlife species. During the year, 10 forest stewardship sites were evaluated, 1 forest stewardship management plans was written, 4 plans were reviewed and 11 needs checks were conducted for landowners within the region.

Deer harvest data analyses and recommendations were prepared for 119 hunt clubs. One hundred and thirteen antlerless deer quota applications from Chesterfield and Kershaw counties were processed. A number of census and survey routes were conducted which included 3 dove

call counts, 15 quail call surveys, 11 mast surveys and 28 furbearer census routes. In addition, the summer brood survey for turkeys and bobwhite quail, goose survey, goose collar sighting survey, fox squirrel survey, mid-winter waterfowl survey and the eagle survey are conducted annually. Sixteen 4-H FACE plots were judged. Project personnel responded to 61 cases involving nuisance wildlife and 1 incident involving injured wildlife. Forty-three programs were presented to civic groups, garden clubs, hunt clubs and sportsmen groups that included 2,463 people. In an effort to promote positive public relations, project personnel participated in a number of other activities such as the Hooked On Fishing Not On Drugs fishing rodeo, U.S. Forest Service fishing derby, youth dove hunts, Big Game antler scoring sessions and the Palmetto Sportsmen's Classic. Telephone calls and office visits remained high with 3,746 public contacts documented.

**Wildlife Region IV** (Berkeley, Charleston, Clarendon, Dorchester, Orangeburg and Williamsburg counties)

The program objective of Wildlife Region IV is to employ the best possible wildlife management techniques to provide public hunting and other recreational activities and opportunities for the sportsmen of South Carolina. This objective is accomplished by conducting a professional wildlife management program on the 249,401 acre Francis Marion Hunt Unit 3,222 acre Santee Cooper Wildlife Management Area, the 2,484 acre Hatchery Waterfowl Management Area, the 2,491 acre Canal Wildlife Management Area, and the 750 acre Sandy Beach Waterfowl Management Area and by providing technical wildlife management assistance to private landowners.

During the 1994-95 deer season, deer harvest in the region increased with a minimum reported harvest of 28,128 deer (13,337 bucks and 14,791 does).

The 1995 spring wild turkey gobbler season in the region produced 1,537 gobblers with 61 of these being checked from the Francis Marion Hunt Unit.

The U.S. Forest Service annual work plans were reviewed, and constant contact was maintained with U.S. Forest Service personnel to review post-Hugo timber and wildlife management activities. The DEIS and draft plan for the Francis Marion National Forest were reviewed and comments provided to the U.S. Forest Service.

Two rather extensive environmental reviews were made on projects planned within the Region. Field investigations were conducted and written reports submitted.

Black bear complaints were handled during the summer. The bear trap was set in Williamsburg County in response to a complaint from a landowner.

Fifteen presentations, workshops and/or tours concerning various aspects of wildlife management were made to 507 people during the year.

The deer in the Dennis Center deer pens were routinely fed and maintained. Approximately 500 people visited the pen this year.

All region personnel spent considerable time planning and working the Fishing Rodeo at the Dennis Center.

A deer management initiative for the Francis Marion Hunt Unit was continued in cooperation with the U.S. Forest Service and the Law Enforcement Division. One public meeting was held with deer hunters utilizing the area. Assistance was given to the Law Enforcement Division in patrolling the Hunt Unit.

Five hundred and thirty five (535) Canada geese were live-trapped in Berkeley and Orangeburg counties and relocated throughout the Coastal plain. Recommendations for a limited season for resident Canada geese were developed and submitted to Columbia.

On the Canal Wildlife Management Area 2,000 cedar and 2,000 pine trees were maintained as part of a cooperative project with the Freshwater Fisheries Section and the Corps of Engineers to improve small game habitat, provide future fish attractor material, and to reduce soil erosion. A small game management plan was designed and implemented for the Canal WMA in cooperation with the U.S. Army Corps of Engineers, the Small Game Project and Williamsburg

County Chapter of Quail Unlimited. The Annual Management Plan for the Canal WMA was also developed and submitted to the Corps. Throughout the region approximately 590 acres were planted to wildlife food producing plants, 226 acres of wildlife food and cover plants were maintained and 27 miles of roads mowed on Wildlife Management Area lands.

One hundred and forty-seven wood duck nest boxes on Santee Cooper Wildlife Management Area were checked to record nesting and productivity data. Sixty-seven wood duck boxes on the Sandy Beach Waterfowl Area were also cleaned and checked for usage. An intensive nest box productivity survey was conducted on the Sandy Beach boxes. One hundred and forty wood duck nest boxes, poles, and predator guards were distributed in cooperation with the wood duck nest box program. Wood duck nest box applicants were contacted in Berkeley, Charleston, Clarendon, Dorchester, Orangeburg and Williamsburg counties to evaluate site potential.

The annual mid-winter waterfowl survey and spring dove call counts were conducted in cooperation with the U.S. Fish and Wildlife Service. Quail census routes were run in Berkeley, Dorchester, and Orangeburg counties to determine trends in the spring breeding population. The annual turkey brood survey was carried out. Twelve furbearer census routes were conducted in Berkeley, Charleston, Orangeburg and Williamsburg counties in cooperation with the Furbearer Project.

Sixty-one deer (28 bucks, 33 does) were taken on the Santee Cooper Wildlife Management Area during three weeks of archery and primitive weapons hunting and a special drawn still-gun hunt held for the first time in 1993. Seventy-eight drawn duck hunters participated in six public hunts held on the Santee Cooper Wildlife Management Area during the 1994-95 waterfowl season. These hunters harvested 205 ducks, for an average of 2.6 ducks/gun. Five hundred and seven hunters were checked during the five public waterfowl hunts conducted on the Hatchery Waterfowl Management Area in 1994-95. These hunters harvested 655 ducks, for an average of 1.3 ducks/gun. On Sandy Beach Waterfowl Area thirty-five drawn hunters harvested 32 ducks for an average of .9 ducks/gun. Total deer harvest on the Francis Marion Hunt Unit increased from the previous year, to 808. The four public dove fields within the Region were good. On the Santee Cooper Wildlife Management Area approximately 200 public dove and waterfowl hunters took an estimated 500 doves. The Canal Wildlife Management Area dove fields were good, with approximately 300 hunters taking an estimated 1,000 doves.

Eight hundred and thirty-three (833) antlerless deer quota applications were processed or investigated within the region as follows: Berkeley-142, Charleston-110, Clarendon-92, Dorchester-87, Orangeburg-175, Williamsburg-227.

Game management plans and technical assistance were provided orally (37) or in writing (28) to approximately 70 landowners requesting management assistance with various wildlife species. Assistance was provided landowners participating in the Forest Stewardship Program with 49 areas inspected, 5 plans prepared, 11 reviewed, and 45 needs checks completed, 14 completion checks, and 19 committee meetings attended.

Data cards were distributed to cooperating deer clubs prior to the season, and deer data analysis were completed for 151 clubs and written reports prepared for 49 deer clubs within the Region.

A dove research project was continued on two study areas (Berkeley-Orangeburg counties and Marlboro County) to determine preseason population densities, harvest rates in the local population, productivity and annual survival rates.

Eight students from Macedonia Middle School participated in the mentor program established between the Department and the school.

A cooperative longleaf pine planting and wildlife opening development program was continued on Santee Cooper Wildlife Management Area in cooperation with the S.C. Public Service Authority



and the Orangeburg Chapter of Quail Unlimited.

A wildlife and forestry demonstration area was maintained at Camp Harry Daniels in cooperation with S.C. State University and the U.S. Forest Service. A demonstration day was held in October for local landowners.

Two wetlands focus area projects were continued under the auspices of the North American Waterfowl Management Plan. These efforts are designed to protect wetlands and associated upland habitats through cooperative joint efforts with partners.

The Cooper River Focus Area Project is guided by a task force that meets monthly. Regular participants include several private landowners, two land trusts, two other conservation organizations and four public agencies. Many other landowners, organizations and agencies support the project and assist on an "as needed" basis. Numerous landowners have been contacted about the project through workshops, meetings, and personal contacts. Land protection priorities have been developed and strategies initiated to protect those with the highest priority. Much of the area is owned by corporate landowners and one major effort is to develop ways they can protect their properties and defend these actions to their shareholders. Several properties are moving toward protection actions.

The Santee Cooper Lakes Focus Area is an area including a major reservoir system of which a good deal is in public ownership. Strategies are being evaluated to improve management on the publicly owned lands and connect them with corridors of privately owned land managed in a compatible manner.

A paper on the effects of Hurricane Hugo on wild turkey on the Francis Marion National Forest was written and presented at the National Wild Turkey Symposium.

The Wild Turkey Project was assisted in trapping and relocating 48 birds as part of the statewide restoration effort.

Landowners in the region received technical advice or assistance in dealing with nuisance wildlife including deer, bears, alligators, Canada geese, raccoons, beavers, otters, opossum, squirrels, armadillos, woodpeckers, and hawks.

The efficiency of the programs is based on the accomplishments of the required staff time for each activity.

The administration, management, data collection and analyzing data from public deer, turkey, waterfowl, and small game hunts comprised approximately 250 man days or 16 percent of this project's activities.

Technical wildlife management assistance to other department personnel, local, state, and federal agencies, and to private landowners through wildlife management plans and the antlerless deer quota program requires approximately 210 man days or 15 percent of this project's activities.

On the ground wildlife management activities on wildlife management area lands through the development, planting, and maintenance of wildlife food plots, planting shrub lespedeza, and trees consume approximately 26 percent of this project's time and funds.

Project administration including report writing, correspondence, budget proposals, game harvest reports, brochures, public presentations, tours, meetings and coordinating with other local, state, and federal agencies and private corporations requires approximately 25 percent of the project's time and resources.

Routine project development, maintenance, and game population surveys accounted for the remaining 20 percent of time and resources expended on this project.

**Wildlife Region V** (Allendale, Barnwell, Bamberg, Beaufort, Colleton, Hampton and Jasper counties).

Objectives in Wildlife Region Five are to intensively manage the natural resources to enhance wildlife habitat, to protect wetlands and other sensitive habitat types, and to provide maximum public opportunities for hunting and other outdoor recreational activities. These objectives are

accomplished through utilization of sound wildlife management and forestry silvicultural practices and procedures on state controlled lands and through technical guidance to private landowners. These objectives were accomplished in 1994-95 on 20,744 acres of both state-owned wildlife management area (WMA) lands and cooperative WMA lands which were either leased by the South Carolina Department of Natural Resources (SCDNR) or under management agreement with SCDNR. State-owned WMA lands included Webb WMA (5,866 acres), Victoria Bluff Heritage Preserve WMA (800 acres), Tillman Sand Ridge Heritage Preserve WMA (952 acres) and Turtle Island WMA (1,700 acres). Cooperative lands included Palachucola WMA (6,757 acres), Cypress Creek WMA (4,029 acres) and smaller WMA tracts (640 acres) owned by Union Camp and Bowater timber companies.

Administrative duties and responsibilities required about 720 man/days or 20 percent of region five personnel time and included maintaining files, handling routine office matters and preparing management plans and reports. Other time was needed to attend meetings and seminars, to prepare public WMA hunting schedules, brochures, news-releases and other publications. In addition, regional biologists gave 58 talks on wildlife management and conservation to 2,030 persons representing a wide variety of groups including university wildlife and forestry classes, hunting clubs, elementary and high school classes, and Webb and Palachucola WMA public deer and quail hunters.

Public hunts required about 1,400 man/days or 40 percent of region five personnel time this year. A total of 220 deer (146 bucks and 124 does) were reported harvested on WMA lands. In addition to deer hunts, public hunting opportunities for wild turkey, small game and feral hogs were provided on WMA lands. Generally good hunting success was reported by public hunters.

The reported deer harvest from privately owned lands in this region in 1994 was 28,725 deer which consisted of 13,527 bucks (47%) and 15,198 does (53 %). During the 1995 spring turkey hunting season, 3,642 sets of turkey tags were issued and 1,867 turkey gobblers were reported harvested in this region.

Two pine timber sales were held on Webb WMA this year. A total of \$140,556 was received for 347,305 thousand board feet of pine sawtimber and 316 standard cords of pine pulpwood. A buyers "operator-select" pine pulpwood sale was held to thin pines in 140 acres. A bid of \$14.98 per ton, to be paid weekly as the pines are cut, was accepted for this sale. Cutting of this timber has not yet been completed. Three pine timber sales were held on Palachucola WMA this year. The first was a clearcut sale of loblolly pine pulpwood in 13 different stands 10 to 36 acres in size totalling 250 acres. These clearcut sites will be later planted in longleaf pine to enhance the habitat for wildlife. The other two sales were thinning of loblolly and slash pine in 1,476 acres. A total of \$1,035,370 was received from timber harvest operations on Palachucola.

Herbaceous plantings, consisting of corn, sorghum, brown-top millet and mixtures of various seeds, were carried out on 243 acres on Webb and Palachucola WMA's in fields and openings. Other management activities on these two areas included prescribed burning of 1,000 acres, mowing of vegetation, maintenance of roads (including grading, filling holes, installing culverts, topping sections of roads with crusher-run rock), and maintenance of buildings and grounds. One hundred thirty-eight (138) wood duck nest boxes were inspected and maintained at Webb, Palachucola, Lake Warren and Lake Brown.

Technical guidance in wildlife management was provided by regional biologists and technicians to landowners and managers on 93 different occasions in region five this year. These activities included management recommendations for deer, wild turkey, small game species and non-game species. In addition, quota applications were received from 840 cooperators in the Antlerless Deer Quota Program. Applications were evaluated and 30,496 antlerless deer tags were recommended to landowners, managers and hunting clubs. Biological deer harvest records, consisting of 5,862 bucks and 6,409 does, were received from antlerless deer quota cooperators.



Harvest records were analyzed by biologists and recommendations for 1995 were provided to cooperators. Region five personnel also assisted with the Forest Stewardship, Turkey Restoration, FACE and Deer Antler Scoring programs. Region five personnel also participated in various cooperative state and federal wildlife annual surveys of quail, dove, waterfowl, bald eagle and furbearers. Assistance was provided in deer-spotlight surveys and deer collection projects on two cooperative research projects in the region. Landowners were also assisted in handling of nuisance and injured wildlife and crop depredation wildlife complaints. Technical assistance activities accounted for over 360 man/days or 10 percent of region five project time.

**Wildlife Region VI** (Darlington, Dillon, Florence, Georgetown, Horry, Lee, Marion, Marlboro, and Sumter Counties)

The program objective of Wildlife Region VI is to employ the most appropriate wildlife management techniques and practices to provide sportsmen and other outdoor users with opportunities for public hunting and other recreational activities. This objective is accomplished by conducting a professional wildlife management program on 75,946 acres of wildlife management area (WMA) lands. These include the South Carolina Public Service Authority (SCPSA) Pee Dee Station Site (2,701 A.), Ellerbe Bay (7,620 A.), Lake Wallace (1,000 A.), Manchester State Forest (MSF 16,000 A.), Marsh Furniture (8,044 A.), Tilghman Heritage Preserve HP (456 A.), Dargan HP (2,387 A.), Lewis Ocean Bay HP (9,343 A.), Great Pee Dee River HP (2,725 A.), Little Pee Dee River HP (3,771 A.), Lynchburg Savanna HP (291 A.), Waccamaw River HP (2,873 A.) and miscellaneous WMA lands (18,167 A.). This objective is also accomplished by providing technical wildlife management assistance to private landowners, lessees, and other groups and individuals.

Reported or known deer harvest throughout the nine county region in 1994 was 14,086 (6,637 bucks and 7,449 does). This exceeded the 1993 harvest of 6,575 bucks and 6,803 does by 5.29 percent, and it represented a 59.36 percent increase over the 1987 harvest. The known WMA deer harvest totaled 272 from the following public hunting areas: Lewis Ocean Bay HP (13), Ellerbe Bay WMA (32), MSF (141), Marsh Furniture WMA (49), Pee Dee Station Site WMA (18), and Great Pee Dee River HP (19).

The 1994 spring wild turkey season resulted in a harvest of 870 gobblers from the following counties: Darlington (55), Dillon (23), Florence (147), Georgetown (244), Horry (63), Lee (46), Marion (139), Marlboro (67), and Sumter (87). These figures include 17 gobblers taken from public hunting areas. This represented a 5.97 percent increase over the 1993 harvest of 821 gobblers and a 2.71 percent increase over the record 1992 harvest of 848 gobblers. Portions of several counties have not been opened due to ongoing restoration efforts.

Wildlife openings on the SCPSA Pee Dee Station Site WMA in Florence County totaling 34 acres were planted in Pennington Spring Game Mix and WGF sorghum. This acreage was also prepared and sown in a fall planting of Ladino clover and wheat. Additionally, 73 sawtooth oak and 87 crabapple seedlings were established. Wildlife plantings at Lake Wallace WMA in Marlboro County included 25 acres of corn, 6 acres of sunflowers, and 22 acres of browntop millet. Another 39 acres of sunflowers, 33 acres of proso millet, and 28 acres of browntop millet were sown in three public dove fields on MSF. Seven shrub lespedeza patches and several hedgerows were established on Manchester SF using seedlings provided by Quail Unlimited..

Wildlife restocking continued to receive some attention with the release of 20 wild turkeys (8 gobblers and 12 hens) on 2 restoration sites in Darlington and Dillon counties. Since 1976, 84 sites in 9 counties have been restocked with 1,333 wild turkeys (440 gobblers and 893 hens).

Technical information and assistance were provided to hunting clubs, landowners, agencies, and businesses. Sixty-two (62) new antlerless deer quotas were processed. During 1994, there were 479 antlerless deer quota cooperators in the Region, up from 455 the previous year, representing a 5.27 percent increase. The 1994 antlerless deer quota program participation in

Region VI represented a 144.39 percent increase over 1986 (196 cooperators).

Meetings were conducted to provide information on crop damage, doe quotas, and other aspects of deer management to sportsmen and landowners, sportsmen's organizations, members of the Legislature, and local officials. Thirty-nine (39) deer trophies were measured in conjunction with the Department's State Record Deer Program.

Assistance was provided to other Department projects by evaluating proposed turkey restoration sites, compiling deer harvest data, and conducting quail call counts (2) and furbearer surveys (18). Mourning dove call counts (2) were conducted in cooperation with the USF&WS. Project personnel and Clemson University researchers participated in a cooperative mourning dove research project and 191 doves were captured and banded in the Bennettsville area.

Applications for wood duck nest boxes were evaluated and 295 nest boxes were distributed to 40 cooperators. To date, 3,411 nest boxes have been distributed to 470 cooperators within the Region. Shrub lespedeza seedlings (97 bags) were also distributed within the Region.

Our contract nuisance alligator control program resulted in the investigation of 142 complaints, issuance of 94 permits, taking of 34 alligators, and relocation of 10 small alligators. The majority of this activity took place in Georgetown County. Additional nuisance animal complaints (107) involved a long list of species, but were primarily attributable to deer depredations upon crops, gardens, and ornamentals; and flooding from beaver impoundments. Approximately 32 injured or disease-suspect animals were brought to our attention and appropriate arrangements were made. Information was provided to citizens about identification and other animal questions on at least 63 occasions.

Project personnel, working with USF&WS and USA Corps of Engineers representatives, participated in the Pocataligo Swamp Study. Forty-three (43) presentations and slide talks on deer management, wild turkey restoration, snake identification, alligators, and other conservation topics were given to civic organizations, hunting clubs, students, teachers' workshops, and other groups.

Several meetings, workshops, and training sessions were attended, including the 17th Annual Southeastern Deer Study Group Meeting in San Antonio, Texas. Assistant Regional Wildlife Biologist Sam Stokes, Jr. presented a paper at the Southeastern Wildlife Conference in Biloxi, Mississippi entitled Effects of Deer Browsing on Important Quail Foods.

The efficiency of the programs are monitored through the staff time required to complete each activity.

The administration, management, and data collection and analyses from public deer, wild turkey, and small game hunts comprised approximately 120 man days or 11 percent of this projects activities.

Technical wildlife management assistance to other Department personnel, local, state, and Federal agencies, and to private landowners through wildlife management recommendations and plans, the antlerless deer quota program, and the contract nuisance alligator control program required approximately 230 man days or 21 percent of project activities.

Wildlife habitat development activities on wildlife management areas through clearing and seedbed preparation, planting, and maintenance of wildlife food plots and tree and shrub plantings, consumed approximately 160 man days or 14.5 percent of project activities.

Project administration including the preparation of reports, correspondence, budget proposals, harvest reports, hunt schedule recommendations, brochures, and maps along with miscellaneous administrative duties including presentations, meetings, workshops, and in-service training, and coordination and cooperation with other Department projects and local, state, and Federal agencies required approximately 400 man days and 36.5 percent of project activities.

Routine project development, custodial functions and maintenance, population surveys,

wildlife disease surveillance, and wild turkey restocking accounted for 190 man days and the remaining 17 percent of time and resources expended on this Project.

### **Waterfowl and Wetlands Management Projects**

The objectives of the Waterfowl and Wetlands Management Projects are to ensure the continued supply of locally produced waterfowl and through cooperation with other State and Federal agencies and private conservation organizations to ensure the continued availability of migratory waterfowl that winter in South Carolina, and to utilize scientifically accepted wetland habitat management techniques to maximize resource utilization and provide public hunting and other recreational activities and opportunities for the sportsmen of South Carolina. These objectives are accomplished by conducting a professional wetlands management program on Department owned and managed properties including Bear Island, Donnelly, Samworth and Santee-Delta WMAs and Santee Coastal Reserve.

A total of 20,963 wetland acres on these Department owned and managed Project properties were intensively managed utilizing state-of-the-science techniques to provide quality production and wintering habitat for local and migratory waterfowl as well as a wide variety of other wetland dependent wildlife species. These tracts represent approximately 29.5% of the total managed tidal wetlands in South Carolina.

The annual midwinter index for South Carolina was coordinated; trend estimates from this survey indicated a total concentration of 133,940 ducks (-32.7% from 1994) were observed in South Carolina in 1995; the 1995 midwinter estimate of ducks was -11.9% from the 10-year average, 1986-95. The 1995 survey represented 5.4% of the estimated Atlantic Flyway population of ducks (-37.2% from 1994). An estimated 15.9% of the Atlantic Flyway dabbling ducks were enumerated in South Carolina (-20.1% from 1994); the number of dabbling ducks was -3.8% from the 10-year average, 1986-95.

Utilizing waterfowl estimates from the 1995 midwinter waterfowl index, 61,704 ducks were enumerated on these projects, +1.6% as compared to 1994; however this number represented 63.3% of the ducks enumerated on coastal managed wetlands (+13.2% from 1994) and 46.1% of the total ducks enumerated in South Carolina (+51.1% from 1994).

Project personnel represented South Carolina on the Atlantic Waterfowl Council Technical Committee and actively served on various constituent committees including the harvest management, wood duck and mallard committees. The waterfowl project leader serves on the International ad hoc committees to evaluate the Flyway Council System and evaluate the regulatory process. Comment or representation on a variety of regional, national, and international wetland and migratory waterfowl matters also was provided by project personnel.

Project and agency efforts have been substantial toward a coordinated interagency endeavor known as the North American Waterfowl Management Plan, the focus of continental waterfowl population management and wetland enhancement and protection. Bear Island and Donnelly WMAs are the premiere projects in the ACE Basin Focus Area. Santee Coastal Reserve and Santee-Delta WMA are the premiere projects of the Santee River Focus Area. Samworth WMA is the premiere project of the Winyah Bay Focus Area. A \$400,000 grant under the North American Wetlands Conservation Act was approved to acquire and enhance 371 acres of prime coastal wetland management units adjacent to Samworth WMA. All focus area initiatives are components of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan.

Additional project activities included coordination and/or assistance of waterfowl banding activities, research and survey projects, various biological collections, analysis of waterfowl and wetlands data, environmental assessment, extension and education.

The participation in and administration of all facets of project activities comprised approximately 300 man days during 1994-95.

### **Samworth and Santee-Delta Wildlife Management Areas**

The objectives of Samworth and Santee-Delta Wildlife Management Areas are to employ multiple use management considerations to provide the highest quality wetland habitat possible to meet the needs of wintering local and migratory waterfowl as well as production habitat for local waterfowl; to provide high quality habitat for a variety of other wetland dependent game, nongame, and endangered species; to provide high quality recreational public fishing and hunting opportunities for waterfowl and mourning dove; to provide showcase areas for education and demonstration of state-of-the-science wildlife management principles and techniques; to provide research facilities for advancement of waterfowl and wetlands management; and to provide accessible interpretive natural areas for appreciative resource use and nature study. These objectives are met by conducting professional wildlife management programs on Samworth (1,260 acres) and Santee-Delta (1,870 acres) Wildlife Management Areas. These areas are located respectively in upper Georgetown County between the Waccamaw and Big Pee Dee rivers and in lower Georgetown County between the North and South Santee rivers.

Through water level manipulation, a total of 1,937 acres on these areas were managed intensively to produce annual crops of naturally occurring, seed producing, herbaceous plants favored as food sources by waterfowl. The emphasis of a major portion of project activities was directed toward maintenance and management of these prime coastal wetlands.

During the 1994-95 waterfowl hunting season on Samworth WMA, 127 hunters were selected to hunt and harvested 171 ducks (1.35 ducks per hunter). Perimeter waterfowl hunting adjacent to Samworth WMA accounted for a minimum of 1,430 man days of effort during 1994-95 (-17.3% from 1993-94 and +17.7% compared to the 12-year average). Total minimum man days of waterfowl hunting opportunities available at Samworth WMA in 1994-95 were 1,557 (-16.1% from 1993-94) representing 49.4% of the total man days of waterfowl hunting available on all Department waterfowl projects.

During the 1994-95 waterfowl hunting season on Santee-Delta WMA, 112 hunters were selected to hunt and harvested 214 ducks (1.91 ducks per hunter). A total of 12 public dove shoots were conducted at Samworth WMA during 1994-95.

Additional project activities included office and building coordination for Wildlife Region VI, Nongame and Endangered Species Upper Coastal Plains Project, and the Atlantic Flyway Field Office of Ducks Unlimited; additionally, more than 3,000 citizens visited Samworth WMA requesting information from one of the several projects or with historical interests. Total public use on these projects was estimated to have exceeded 7,500 man days during 1994-95.

Administration including supervision, planning, fiscal administration, report preparation, inspection, data analysis, coordination and general office routine comprised approximately 200 man days of project activities.

Wildlife habitat management maintenance and development activities including clearing seedbed preparation planting, debris remove, dike repair, mowing, rotovation, prescribed burning, water level management, etc., comprised approximately 180 man days of project activities.

The preparation for and administration of public hunting programs including data collection comprised approximately 120 man days of project activities.

### **Waterfowl and Wetlands Landowner Technical Assistance**

The objective of the Waterfowl and Wetlands Landowner Technical Assistance Project is to furnish information on scientifically based and proven techniques to enhance management, development and maintenance of valuable manageable wetland habitats. This objective is met through contact with requestors and provision of appropriate information that enable maximum resource and recreational utilization for the citizens of South Carolina.

A total of 91 requests for technical guidance/information were received during 1994-95. All requestors were provided appropriate information and various handouts summarizing applicable

wetland management techniques and steps to positively influence resource use and recreational availability. Of these, 37 required field investigations and written recommendations/management plans were provided to 13 landowners.

#### **Winyah Bay Focus Area**

Under the guidelines of the North American Waterfowl Management Plan Atlantic Coast Joint Venture, a broad based habitat protection and enhancement strategy known as the Winyah Bay Focus Area, initiated in 1991-92, was continued. This program will identify, categorize and seek various levels of natural resource protection on key tracts within the confines of the lower Winyah Bay drainage system. A Task Force was formed to coordinate and direct Focus Area initiatives. Task Force members include Brookgreen Gardens, Ducks Unlimited, Historic Ricefields Association, International Paper Company, South Carolina Waterfowl Association, South Carolina Department of Natural Resources, U.S. Fish and Wildlife Service, and private landowners. A number of Task Force and working meetings were conducted to refine objectives, work with private landowners, assemble a natural resource inventory for the Focus Area, and communicate goals and accomplishments.

The Winyah Bay Focus Area comprises some 360,000 acres; 270,00 acres of the project total is tidally influenced wetlands, river swamp or open water. The largest contiguous block of intertidal freshwater wetlands in South Carolina occurs in the project boundary. Acre-for-acre the most valuable waterfowl habitat in South Carolina and the highest concentration of recreational waterfowl hunting in South Carolina occurs in the Winyah Bay Focus Area. Only a small portion (35,530 acres) of the wildlife habitat in the Winyah Bay Focus Area core are protected by agency ownership or conservation easements; this represents only 13.2% of the high priority project acreage.

Specific accomplishments completed in the 1994-95 include the recording of a private land conservation easement on Weymouth Plantation, continuing documentation on a proposed National Wildlife Refuge and approval of the grant request through the North American Wetlands Conservation Act.

#### **Statewide Wood Duck Nest Box Project**

The objective of the Statewide Wood Duck Nest Box Project is to construct and provide wood duck nest box units to cooperating landowners to enhance wood duck breeding populations in South Carolina by augmenting productivity from naturally occurring tree cavities. Secondly, landowner involvement in wildlife conservation and management programs fosters educational opportunities for cooperators and their families.

A total of 288 applications from prospective cooperators were received and evaluated for inclusion into this project. During 1994-95, approximately 1,544 nest boxes were constructed and 1,389 nest box units were distributed to 200 new cooperating landowners. Through the 14th year of this project, 2,630 cooperators have received 19,800 nest box units and approximately 1,173 units have been allocated to agency projects.

Data analysis from the 1994 nesting season indicated that 8.3% of project cooperators returned requested data forms, and minimum estimated production during this period was approximately 5,089 ducklings.

Various mailings throughout the year were made to all new and previous cooperators. Considerable administrative effort was made to upgrade cooperator lists and improve project mailings. A new cooperator information base and data base program was written to better and more efficiently manage this system.

Project administration including report writing, correspondence, scheduling, coordination of logistics, data entry and analysis required approximately 200 man days of activities.

#### **Santee Coastal Reserve State Project**

Santee Coastal Reserve is located in southeastern Georgetown County and northeastern

Charleston County between the North Santee River and Cape Romain National Wildlife Refuge. It consists of two barrier islands and a mainland portion. Eleven thousand, six hundred and sixty-one acres of impoundments are managed for wintering waterfowl. Waterfowl numbers on SCR during the winter of 1994-95 were 41,329, essentially unchanged from the 1994 count. The southernmost flock of lesser snow geese in eastern North America overwinters here. The upland acreage of the mainland is managed for public deer hunting. Twenty-two deer were harvested during the 1994-95 season. The area is open for public archery hunts during the first and last complete weeks in October. Santee Reserve is managed as a multiple-use area with waterfowl as the featured species group. Other target species include deer, turkey, Atlantic loggerhead sea turtles, bald eagles, red-cockaded woodpeckers, osprey, quail, and numerous wading and shorebirds. Two thousand wood duck nest boxes are constructed on this project annually for free distribution to private landowners. Public utilization of the area is high for a Wildlife Management Area with over 10,000 annual man-use days. This utilization includes camping, hiking, guided tours, hunting fishing, outdoor academic classes and bird watching. All interpretive signs on all 4 trails are color coded and keyed to a large map at the trailhead kiosk. Guided tours and technical and non-technical lectures were presented to over 1,200 visitors. Sixty acres of forest openings are planted for forest birds and mammals. Waterfowl and shorebird management is accomplished by water level manipulation in the impoundments. Eighty-six pair of endangered wood stork were documented as nesting on SCR this spring, producing 232 chicks for a per nest average of 2.70. The South Carolina Forestry Commission manages timber sales and cutting operations. Additionally the South Carolina Department of Natural Resources manages the 1,100 acre Washo Reserve through cooperative agreement with The Nature Conservancy. Utilization of the 800 foot boardwalk in the Washo Reserve is at an all-time high. Boardwalks and wildlife observation blinds have been maintained in conjunction with the Marshland Nature Trail and the Bike/Hike Trail. All nature trails, hiking trails, and canoe trails are maintained and are open for public use. Public Use regulations have been published and public use has been expanded. An "Adaptive management" theme governs most research and management activities. This method of operation involves continual basic research with learning from the experience and results.

### **ACE Basin Project**

The Ashepoo, Combahee and Edisto (ACE) River Basin Project is a comprehensive, multifaceted effort to protect in perpetuity a nationally significant 350,000 acre coastal wetland ecosystem. Wetlands within the project area provide critical habitat for resident and migratory waterfowl as well as a wealth of other wetlands-dependent wildlife species including five federally-listed endangered/threatened species (southern bald eagle, wood stork, shortnose sturgeon, American alligator, and loggerhead sea turtle). Accordingly, the project area, representing one of the largest undeveloped wetland complexes along the Atlantic Coast, has been identified as a principal focus area of the North American Waterfowl Management Plan's Atlantic Coast Joint Venture.

The project is jointly funded and directed by the ACE Basin Task Force consisting of: S.C. Department of Natural Resources (SCDNR), Ducks Unlimited(DU), The Nature Conservancy (TNC) and private landowners. To date 108,121 acres of land have been afforded permanent protection. Specific protection accomplishments in 1994-1995 include the acquisition of 1,324 acres for the ACE Basin National Wildlife Refuge and conservation easements placed on 1,460.5 acres of land. The refuge now totals 11,014 acres and conservation easements 35,544 acres. Ownership of South William Island in the National Estuarine Research was transferred to the Department.

DNR staff provided technical and logistical support in the efforts to protect these properties. Two issues of "*Current Events*", the ACE Basin newsletter were produced and distributed. Wildlife management staff made 10 presentations (including tours) to over 150 individuals.



### **Donnelley Wildlife Management Area**

A part of Wildlife District VIII, Donnelley is located in eastern Colleton County adjacent to U.S. Highway 17 near Green Pond. Donnelley was named in honor of the late Gaylord Donnelley and his wife Dorothy for contributions they made to the ACE Basin Project and conservation across the continent. This unique property of 8,048 acres encompasses a diversity of wetland and upland habitat types including: managed wetlands, backwaters, forested wetlands, tidal marshes, agricultural fields and a variety of forest types. The objectives of Donnelley are intensive management to provide optimum habitat for resident and migratory wildlife and to provide a variety of recreational opportunities for the general public. To meet these objectives the following activities were performed during 1994-1995:

A total of 164 acres of agricultural plantings were made for public dove fields. Prescribed burning was conducted on 1,750 acres of uplands to improve wildlife habitat. Water level management and agricultural plantings were utilized on 2,046 acres of wetlands to provide wintering waterfowl and wading bird habitat. In conjunction with wetlands management, 42,240 linear feet of dike were maintained by rotary mowing. Thirty-three miles of roads were maintained by rotary mowing and grading. Seven miles of roads were graveled. Twenty-five acres of wildlife openings were planted to annuals to provide food and cover for forest dwelling wildlife. One hundred fifty-three woodduck boxes were maintained. The public hunting program provided 1,760 man-days of recreational opportunities for dove, rabbit, quail, raccoon, squirrel, snipe, deer and waterfowl. Deer hunting was the most popular with 1,162 man-days of activity recorded and a harvest of 87 deer. A new entrance sign and 32 other informational signs were constructed and erected. Two kiosks were built for information dispersal and a new wildlife trail opened. Donnelley also provided considerable recreation to appreciative users including birdwatchers, hikers, and photographers. Organized groups using Donnelley for educational purposes included school groups, teacher workshops and conservation organizations.

### **Bear Island Wildlife Management Area**

Bear Island Wildlife Management Area, Wildlife District VIII, is located in Colleton County, and consists of approximately 12,000 acres including 5,319 acres of dike marsh; 5,005 acres of tidal marsh; 1,227 acres of woodlands and 404 acres of agricultural land. The objectives of Bear Island are intensive management to provide optimum habitat for resident and migratory wildlife and to provide compatible recreational opportunities for the general public. To meet these objectives the following activities were performed during 1994-1995.

Active water level manipulation was practiced on the managed wetlands to provide optimum habitat conditions for resident and wintering waterfowl, shorebirds and wading birds. In conjunction with wetlands management, maintenance was performed on 60 water control structures and 90 miles of dikes, roads and trails. One hundred thirty-six acres of agricultural fields were planted and manipulated to provide foraging habitat for upland wildlife.

The public hunting program provided 972 man days of recreational opportunity for waterfowl, dove, rabbit, raccoon, snipe, quail, squirrel and deer. Waterfowl hunting provided the most recreation with 402 participants harvesting 842 birds (2.01 birds/hunter). Public fishing on the area (April 1 - September 30) provided an estimated 5,000 man-days of recreation. Other recreational uses of Bear Island including birdwatching, hiking and wildlife photography provided an estimated 3,000 man-days of recreation.

Bear Island provides camping facilities and accommodated a variety of groups including universities, high school classes, Scout troops and other conservation groups. Personnel provided numerous tours and educational programs to these and similar groups.

### **Wild Turkey Project**

The objectives of the Wild Turkey Project are to produce and maintain a healthy and dynamic wild turkey population, and to evaluate and restock as many qualified wild turkey restoration

sites as possible annually, in order to establish a viable or huntable population in every county.

Four new sites in 3 different counties were stocked with 65 turkeys and 1 existing restoration site received an additional 4 birds. Another 21 turkeys were sent to North Carolina to assist in their restoration efforts. A total of 184 sites have been stocked with 3,188 birds since 1976.

The summer turkey survey provides information on reproductive trends and success of restoration. During the summer of 1994, 1,943 observations resulted in the sighting of 13,117 turkeys. Overall observations increased but the poult to hen ratio of 3.9 was a slight decrease from the previous year indicating fair to good reproduction last summer.

No fall season was held in 1994. The 1995 spring season resulted in 11,692 birds checked and 33,076 sets of tags issued. A portion of all 46 counties now have an open spring gobbler season.

Eleven presentations on the Turkey Project were made to various groups across the state and technical assistance was provided to at least 15 landowners.

Four National Wild Turkey Federation (NWTF) fund raising banquets, 4 board of director meetings, and the Technical Committee meeting were attended. The Southeast Wild Turkey Committee meeting held in conjunction with the Seventh National Wild Turkey Symposium in South Dakota was attended. A manuscript titled "Effects of Hurricane Hugo on the Francis Marion National Forest Wild Turkey Population" was prepared and presented at the symposium. At least 33 NWTF Super Fund projects were reviewed and funded. Total Super Fund expenditures for projects to benefit turkeys were in excess of \$52,000 in 1994-95.

The efficiency of restoration programs is measured in costs to the department and accomplishments. Actual cost figures per turkey trapped and relocated are not calculated, but statewide trapping efforts this year were only conducted from late-January through February, resulting in minimal cost to the Department.

Collection of harvest data and distribution of turkey tags is handled primarily by non-Department operated check stations. Basic cost to the Department is minimal. Harvest data is entered into computers by region and forwarded to the main computer in Columbia for final data analysis. The use of computers has effectively decreased cost and time involved in preparation of final reports.

### **Statewide Deer Project**

Deer Harvest Summary: The annual statewide deer harvest summary was completed, printed and distributed. This task revealed that a minimum of 138,965 deer were taken by hunters during 1993-94. This represents a 2.7% decrease over 1993-94. The harvest on WMA lands included 54,944 deer or 2.2% less than 1993-94. The harvest on private land in the 28 county coastal plain area was 77,631 or 3.2% less than 1993-94. Statewide, does comprised 47% of the total harvest, while bucks comprised 53%.

Antlerless Deer Quota Program: The antlerless deer quota for the 28 county coastal plain area was administered by the Deer Project. This program was modified several years ago to include a choice of either-sex days or tags and a \$50 application fee was established. Sixty-nine thousand and seventy-nine tags were issued to 2,413 cooperators on just over 4 million acres of land. In addition, just over \$120,000 was collected, deposited and expended as required by the enabling law. The antlerless deer tag program for the piedmont was administered. This new program resulted in the issuance of just over 44,000 tags to just over 21,000 applicants. This program resulted in the collection of just over \$217,00.

Antler Records Program: Game Section biologists conducted 18 antler scoring sessions during the year, at which, 500 sets of antlers were scored using the Boone and Crockett system. This effort resulted in the addition of 193 heads to the state records list. Data for the successful heads were entered, verified and edited and certificates were mailed to each owner. This effort resulted in the qualification of two heads for listing on the Boone and Crockett Club's all-time list



bringing the state total to three.

**Cooperative Deer Management Program:** Harvest data was received from approximately 1,400 hunt clubs during 1994-95. Each club who supplied data on deer harvested was provided with an analysis of its respective data and harvest recommendations for the 1995 season were made.

**Deer Depredation Program:** The Deer Project assisted the Law Enforcement Section in administering the depredation program. This project involved the purchase of tags, the printing of necessary forms and training of appropriate staff. Necessary file maintenance and record updating was performed.

**Public Relations:** Forty-one public presentations involving deer were made to civic and sportsmen's groups and eight news releases were prepared and offered as a part of the Department's public information package.

**Research:** The Deer Project was involved in three research efforts during the year. Two of the projects involve deer-crop interactions include (1) a community approach to deer herd reduction and (2) an investigation of the impact of simulated deer browsing on the yield of soybeans. The other project is an ongoing investigation of the mortality and dynamics of a Jasper County deer population. Two additional research efforts were planned for initiation in FY96. These include an investigation of the biology and condition of deer on Sea Pines Plantation on Hilton Head Island and a complete analysis and evaluation of historic deer harvest and condition information.

### **Furbearer Project**

**Technical assistance:** Six hundred forty-nine depredation permits were issued statewide to property owners suffering damages from nuisance furbearers. Numerous on site visits were made to assist landowners with animal damage control. Beaver control workshops were conducted for landowners dealing with nuisance beaver situations. A trapper assistance list was prepared for distribution to property owners interested in contracting nuisance furbearer control. Forty-two percent of all licensed trappers responded by agreeing to assist. Technical assistance brochures, slide programs and videos were developed and distributed to assist landowners in controlling nuisance furbearers. Numerous meetings and workshops were held with local fox hunting, raccoon hunting and trapping organizations to address regional furbearer matters.

**Education:** Twenty presentations were made to various school classes, teacher workshops, university seminars and sportsmen groups with a total audience of 450 individuals. Two presentations on furbearer research and management were given at professional conferences. Two news articles were written and numerous interviews granted to news and magazine writers on furbearer related subjects. The bi-annual furbearer news bulletin was produced. This year's issues included sixteen articles on furbearer management related subjects.

**Harvest Monitoring:** The level of commercial fur harvest is monitored annually through mandatory reports of commercial licensees and through a fur tagging system. These surveys reveal that fur values for some species improved again this year. Overall, fur values remained well below the levels of the early 1980's but are approaching levels which are expected to result in increased participation by sport trappers. The number of sportsmen participating in the commercial fur harvest is 66% below the peak of 1,395 licensees during the 1987-88 season. The commercial harvest of all furbearers combined remains 74% below the ten-year average. While total harvest of furbearers increased only slightly this season, a substantial increase was reported for coyotes due to increasing population levels of these canids. The annual requirements outlined by the Convention on International Trade on Endangered Species (CITES) were submitted to the U. S. Fish and Wildlife Service for export approval of South Carolina bobcat and river otter pelts. Population trends and harvest estimates were predicted in order to justify the continued harvest of these two species.

**Population Monitoring:** The annual Scent Station Survey included 1,530 tracking stations to determine the relative abundance of bobcats, foxes, raccoons and free ranging dogs. The annual

Raccoon Field Trial Survey was conducted to analyze raccoon hunting success data for comparisons between regions, years and seasons within years. This year's survey recorded the hunting success of 1,525 hunt parties. The invasion of coyotes into South Carolina continues to be monitored. Current information indicates that the animals are established in all counties bordering the Savannah River. Random observations of coyotes have occurred in nearly two-thirds of the remainder of the state. Furbearer population monitoring through determination of age structure continues using a process of cementum analysis.

Research: Furbearer related research included:

- 1) Impacts of sport raccoon hunting on deer behavior and deer hunting success rates
- 2) Participation in regional and international efforts to develop international humane trap standards
- 3) Validation of the Scent Station Survey and Raccoon Field Trial Survey using known levels of raccoon population reduction.

Administrative Activities: Legislative updates were periodically provided to the state's Trapper's Association, Raccoon Hunter's Association and Fox Hunter's Association. Legislators and House and Senate Committee researchers were assisted with a variety of furbearer related bills. The annual Commercial Fur Harvest Regulations brochure was produced and distributed to the furbearer resource users. Two hundred seventy-four fox and raccoon field trial permits and 15 fox running pen permits were issued. The project successfully converted computer operations to an IBM compatible system. The conversion included training, program conversion and data re-entry.

District Related Activities - Calhoun County: On site technical assistance for wildlife management recommendations was provided to numerous landowners in Calhoun County. The Nuisance Alligator Control Program was coordinated for the Midlands District. Fifty two doe quota applications were processed. Deer harvest data was analyzed and reports prepared for 11 hunt clubs participating in intensive deer management programs. The project supervisor served on the Calhoun County Conservation Review Committee. Other Calhoun County projects include judging of the F.A.C.E. food plots, conducting the annual quail call survey, establishing turkey check stations and distribution of wood duck boxes.

### **Small Game Project**

The objective of the Small Game Project is to monitor and manage the small game resources of the state for the well being of small game populations and for the benefit of the public, and to effectively manage small game populations through technical assistance, research and surveys, education and liaison with other state and federal agencies and private conservation organizations.

Technical assistance was provided to 22 landowners in 1994-95, throughout the state. Each site was visited, evaluated and detailed written recommendations on small game habitat development prepared. A minimum of 18,850 acres will be favorably affected by the technical assistance program.

Regional wildlife biologists were assisted with small game habitat development on Wildlife Management Area (WMA) lands. Ongoing projects at Webb Wildlife Center in Hampton County (5,800 acres), Fant's Grove WMA in Anderson County (8,000 acres) Crackerneck WMA in Aiken County (4,700 acres), Santee Cooper WMA in Orangeburg County (2,800 acres), the Francis Marion National Forest in Berkeley and Charleston Counties, Sand Hills State Forest WMA in Chesterfield County (46,000 acres), Manchester State Forest WMA in Sumter County (29,000 acres), Canal WMA in Berkeley County (1,500 acres) and on U.S. Forest Service lands in Union County were continued. New projects were initiated on the McBee WMA in Chesterfield County (780 acres), and on U.S. Army Corps of Engineers land in McCormick County (1,200 acres).

The S.C. Forestry Commission and the S.C. Department of Parks, Recreation and Tourism were assisted with development of a multi-purpose dog-training and recreation area on Sand

Hills State Forest. The H. Cooper Black, Jr. Memorial Field Trial and Recreation Area encompasses approximately 6,000 acres and will serve the needs of many S.C. citizens.

The South Carolina Forestry Commission was contracted to grow shrub lespedeza seedlings, which are then provided to the public. One million seedlings were available for distribution, with 892,000 being sold to the general public and the remainder utilized on WMA lands.

Sixty-three public and private shooting preserve operations were licensed. Revenue received from license fees was \$55,450. Nine preserves and commercial quail breeders were inspected and/or provided with technical assistance.

Twenty-one programs and presentations on small game management and general wildlife ecology were provided to approximately 740 persons in various groups including but not limited to: school classes, teacher workshops, Quail Unlimited Chapters, Wildlife Action Chapters, Extension Service groups and field trial associations. Two overnight seminars on bobwhite quail management were conducted, attended by 65 landowners or managers controlling considerable acreage of potential quail habitat.

Twenty-eight counties participated in the 4-H Food and Cover Establishment (F.A.C.E.) for Wildlife Program, with 100 food plots entered in the contest. Thirty-four counties were enrolled in the F.A.C.E. Program for the coming year.

The Bobwhite Quail Whistling Cock Survey was conducted for the 16th consecutive year and the Small Game Hunting Survey was conducted for the 8th year. An annual survey of hunting success by rabbit hunters was conducted for the 4th consecutive year, and a summer Quail Brood Survey was conducted in conjunction with the Wild Turkey Brood Survey for the 2nd year. The U.S. Fish and Wildlife Service S.C. Cooperative Research Unit was assisted with continuation of a mourning dove research project in Marlboro and Orangeburg Counties. A research project to evaluate possible effects of deer browsing on bobwhite quail food plants at Webb Wildlife Center continued for the 3rd year. Project staff also coordinated the U.S. Fish and Wildlife Service's Annual Woodcock Wingbee which was held at the Webb Wildlife Center in Hampton County during January.

Fifteen Quail Unlimited (QU) meetings and fund raisers were attended and cooperative projects for habitat improvement and education developed. Joint SCDNR-QU projects involved \$17,374 QU dollars.

The project supervisor served on the State Conservation Review Group of the Consolidated Farm Services Agency, and the State Technical Committee of the Natural Resources Conservation Service, which are responsible for reviewing and recommending changes in regulations governing various federal agricultural programs such as the Conservation Reserve Program (CRP), Agricultural Conservation Program (ACP), Acreage Conservation Reserve (ACR) and the Wetland Reserve Program (WRP). Each of these incentive programs has potential beneficial as well as detrimental impacts on wildlife. The project supervisor also represented the department on the South Carolina Forestry Association Wildlife and Recreation Committee, the South Carolina Tree Farm Committee, the Southeastern Association of Fish and Wildlife Agencies Dove Technical Committee and Farm Wildlife Committee, the South Carolina State Committee of Quail Unlimited, the South Carolina Commission on Sporting Dogs and Field Trials Advisory Committee, as well as serving as Chairman of the Southeastern Section of The Wildlife Society Farm Wildlife Committee. The project supervisor also co-chaired a regional task force to develop recommendations for the 1995 Farm Bill for the Southeastern U.S.

One hundred sixty-eight small game field trial permits, 13 depredation permits (mostly for nuisance gray squirrels), and 23 quail recall pen permits were issued. Also, 11 bird dog training licenses were issued and 6 rabbit enclosures approved.

Program efficiency is monitored through accomplishments. The technical assistance program resulted in habitat management plans for 857 acres per landowner visited. Shooting preserve

revenue generated was \$880 per operation licensed. Cooperative projects with Quail Unlimited (QU) resulted in expenditure of \$1,336 QU dollars per local QU Chapter.

### **Statewide Alligator Project**

The objective of the alligator project is to promote and maintain a healthy and safe alligator population, and to protect and manage the alligator resource by monitoring alligator population trends. Primary responsibilities of the project include the administration of the Alligator Control Program, the issuance of marketing permits to and the inspection of establishments that sell alligator products, the execution of night spotlight surveys to determine population trends, and to conduct research to gain a better understanding of the alligator resource.

During the reporting period, 735 nuisance alligator complaints were received and over 200 alligators were captured and processed. Three alligator hide sales were conducted generating \$92,165.49 in sales. The state retained \$6,912.41, and the majority remaining was given to control agents due to a depressed hide market. Sixty-six (66) businesses were permitted to market alligator products; generating \$2,310.00 in state revenue. Eighteen (18) night spotlight surveys were conducted on sample areas to provide an index of the alligator population. The Private Lands Harvest Program was approved during the 1994 Legislative session. The Department has gained approval from the U.S. Fish & Wildlife Service and has established a licensing, tagging and permitting procedure. The harvest will begin in September 1995.

Dissemination of information to the public was tremendous. The project supervisor completed 3 television interviews, 2 magazine interviews, 2 radio interviews, and completed 4 news releases. Additionally, 14 public talks were given to 854 people.

Research concerning hatchling temperature-dependant sex ratios was initiated. A research project concerning mitochondrion DNA in alligators is continuing in cooperation with the University of South Carolina. The Project Supervisor co-authored a paper on the effects of Hurricane Hugo on the population of wild turkeys on the Francis Marion National Forest.

Other work that the project supervisor contributed to included participation in the summer Teacher's Workshop sponsored by the The Wildlife Society. Assistance was provided to Region IV with public waterfowl hunts, deer check stations, law enforcement on the Francis Marion WMA, technical advice, and nuisance animal calls.

Approximately 95% of the budgeted time and funds were spent on the Alligator Project - 40% Nuisance Control Program, 25 % private lands harvest program, 10% research, 10% public presentations, and 10% surveys. The remaining 5% of funds and time were apportioned to other duties.

### **Forest Stewardship Program**

The purpose of the Forest Stewardship Program is to assist and encourage non-industrial private landowners in actively managing natural resources on their property. The State Forestry Commission administers the program and other natural resource management agencies provide input in their particular area of expertise.

In October, 1991, the South Carolina Department of Natural Resources officially began participating in the stewardship program. In September, 1993, Judy Barnes, a wildlife biologist, was hired full time to assist regional biologists with this program. She initially covered the entire state but in June, 1994, a second wildlife biologist, Mike Van Brackle, was hired. Judy has the responsibility of the piedmont, mountain and the Pee Dee area while Mike covers the lower coastal counties of the state. Responsibilities include site inspections, written wildlife recommendations according to landowner's objective for that particular site, development of specifications for practices that benefit wildlife, needs and compliance checks regarding those practices under the Stewardship Incentive Program (SIP), attendance at cross training workshops and presentations of the stewardship program. During fiscal year 1994, wildlife management section personnel reviewed 125 plans, visited 268 sites, were principal authors/coauthors on

227 plans, conducted 158 needs checks and 61 compliance checks for a total of 430 person days.

The stewardship biologists also serve on committees such as: Forest Stewardship Incentive Program Funding Committee for the Camden, Sumter, Lexington, Orangeburg and Walterboro Areas; Forest Stewardship Coordinating Committee's SIP Policy and Procedure Subcommittee; South Carolina Chapter of The Wildlife Society Weeds Committee; South Carolina Red-Cockaded Woodpecker Conservation Coalition; and Forest Management Ad Hoc Committee. Programs on forest stewardship, forestry, wildlife and the Outdoors-Woman were presented to approximately 345 participants during the past year.

#### **Tom Yawkey Wildlife Center**

This wildlife center was willed to the State in 1976 by the late Thomas A. Yawkey and a perpetual trust was established by way of The Yawkey Foundation to totally fund the operation of the twenty thousand acre wildlife preserve and research area located at the mouth of Winyah Bay in Georgetown County. The Trustees of The Yawkey Foundation not only manage the trust fund but coordinate with the Program Manager and the Deputy Director of the Wildlife and Freshwater Fisheries Division to make sure that the programs and objectives of the wildlife center comply with those directed by Mr. Yawkey's will.

This area provided top quality wintering habitat for thousands of migrating waterfowl on its approximately 3,000 acres of managed wetlands. The protected wetlands are considered a major staging area for migrating shorebirds. Tremendous numbers of wading birds, endangered species and raptors make use of the habitats year round. Approximately 250 species of birds utilize the habitats on an annual basis. The 12 miles of virgin barrier island beaches on North and South Islands are a major nesting area for loggerhead sea turtles and provide feeding and resting areas for eastern brown pelicans, gulls and shorebirds. The pristine estuarine marshes protected by the barrier islands provide nursery areas for myriads of marine species.

The area serves as a field laboratory for research by many universities and private researchers in addition to the South Carolina Department of Natural Resources.

Prearranged weekly educational field trips were conducted throughout the year as approved by the Yawkey Foundation under the guidelines established in Mr. Yawkey's will.

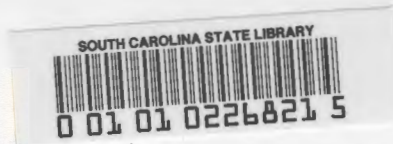
In addition a year long bird survey by season produced a seasonal bird checklist of 250 species that utilize the center and surrounding vicinity.

A forty-five minute video representing all aspects of the center was produced and 500 copies were made for distribution.

The center was utilized in conjunction with a study of bird migration utilizing ultra-lite aircraft to establish migration routes for endangered species.







### Mission Statement

The South Carolina Department of Natural Resources is the advocate for and steward of the state's natural resources. The Department of Natural Resources develops and implements policies and programs for the conservation, management, utilization and protection of the state's natural resources based upon scientifically sound resource assessment and monitoring, applied research, technology transfer, comprehensive planning, public education, technical assistance and constituent involvement. The Department of Natural Resources is pro-active in protecting the state's natural resources for use and enjoyment by future generations of South Carolinians.



The South Carolina Department of Natural Resources prohibits discrimination on the basis of race, sex, color, national origin, religion, disability or age. Direct all inquiries to the Office of Human Resources, P.O. Box 167, Columbia, S.C. 29202.